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Results Of The 1985 CQ WW WPX SSB Contest . . . p. 13

THE RADIO AMATEUR'S JOURNAL

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NEW! Computer Interface!

"DX-cellence!"

TS-940S

The new TS-940S is a serious radio for the serious operator. Superb interference reduction circuits and high dynamic range receiver combine with superior transmitter design to give you no-nonsense, no compromise performance that gets your signals through! The exclusive multi-function LCD sub display graphically illustrates VBT, SSB slope, and other features.

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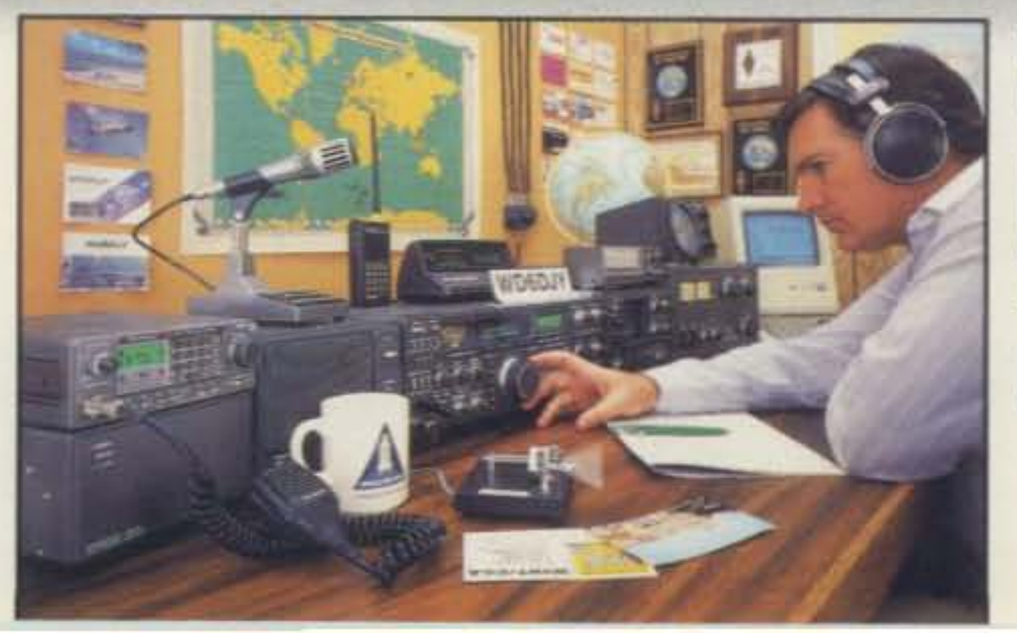
- **High stability, dual digital VFOs.** An optical encoder and the flywheel VFO knob give the TS-940S a positive tuning "feel."
- **Graphic display of operating features.** Exclusive multi-function LCD sub-display panel shows CW VBT, SSB slope tuning, as well as frequency, time, and AT- 940 antenna tuner status.
- **Low distortion transmitter.** Kenwood's unique transmitter design delivers top "quality Kenwood" sound.
- **Keyboard entry frequency selection.** Operating frequencies may be directly entered into the TS-940S without using the VFO knob.
- **QRM-fighting features.** Remove "rotten QRM" with the SSB slope tuning, CW VBT, notch filter, AF tune, and CW pitch controls.
- **Built-in FM, plus SSB, CW, AM, FSK.**
- **Semi or full break-in (QSK) CW.**
- **40 memory channels.** Mode and frequency may be stored in 4 groups of 10 channels each.
- **Programmable scanning.**
- **General coverage receiver.** Tunes from 150 kHz to 30 MHz.
- **1 yr. limited warranty.** Another Kenwood First!

Interface IF-232C/IF-10B

Optional accessories:
• AT-940 full range (160-10m) automatic antenna tuner • SP-940 external speaker with audio filtering • YG-455C-1 (500 Hz), YG-455CN-1 (250 Hz), YK-88C-1 (500 Hz) CW filters; YK-88A-1 (6 kHz) AM filter • VS-1 voice synthesizer • SO-1 temperature compensated crystal oscillator • MC-42S UP/DOWN hand mic. • MC-60A, MC-80, MC-85 deluxe base station mics. • PC-1A phone patch • TL- 922A linear amplifier • SM-220 station monitor • BS-8 pan display • SW-200A and SW-2000 SWR and power meters.



25th Anniversary

Complete service manuals are available for all Trio-Kenwood transceivers and most accessories.
Specifications and prices are subject to change without notice or obligation.

More TS-940S information is available from authorized Kenwood dealers.

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• Covers all Amateur bands
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Eight memory channels store frequency, mode and band data. Channel 8 may be programmed for split-frequency operation. A front panel switch allows each memory channel to operate as an independent VFO or as a fixed frequency. A lithium battery backs up stored information.

• Programmable, multi-function scan.

• Speech processor built-in.

• Dual digital VFOs.

• VOX circuit, plus semi break-in with sidetone.

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- Compact DIN size

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Actual size front panel

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- **VS-1** voice synthesizer
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- **PG-3A** DC line noise filter
- **MB-10** extra mobile bracket
- **CD-10** call sign display
- **PS-430** DC power supply for TM-255OA/2530A
- **PS-50** DC power supply for TM-2570A
- **MC-60A/MC-80/MC-85** desk mics.
- **MC-48** extra DTMF mic. with UP/DWN switch
- **MC-42S** UP/DWN mic.
- **MC-55** (8-pin) mobile mic. with time-out timer
- **SP-40** compact mobile speaker
- **SP-50** mobile speaker
- **SW-200A/SW-200B** SWR/power meters
- **SW-100A/SW-100B** compact SWR/power meters
- **SWT-1** 2m antenna tuner

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The Radio Amateur's Journal

ON THE COVER: Bernie Welch, W8IMZ, CQ's Contest Advisor, gave Steve Bolia, N8BJQ/6 a welcome helping hand in scoring the WPX logs this year. Bernie's trusty magnifying glass picked up a few "interesting" log entries. Photo by Larry Mulvehill, WB2ZPI.

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Zero Bias

AN EDITORIAL

Did you ever get the feeling that something is wrong with the premise of an argument, and both sides are fallacious? Well, I get that feeling with everything I read about the pros and cons of an individual's ability to receive a transmitted signal, especially cellular telephone signals. The government, our government, has committees studying specific legislation to prohibit or ban under threat of punishment the reception of plain-language transmissions. Ultimately, if you can accept the premise that this is needed, there will be test cases and 20 or 30 exceptions to this proposed legislation. There will also be, if you extend this logic, watchdogs to enforce specific ordinances and a burgeoning group of legal experts who will prosecute and defend these actions. This situation we are to accept as normal logic.

A few months ago the newspapers printed an expose that a "ham" was able to listen in on Air Force One, the President's plane, and overheard the President discussing important issues in plain language. The nation could have been compromised, and all sorts of terrible, dire consequences were envisioned should the information have gotten into the wrong hands. There was talk of prosecution, and shoring up the leaks by making it a crime to listen in. The logic here is the same logic that's being used to create current legislation.

I would tend to think that in the case of the President, it really should be feasible, practical, and of prime importance to have his transmissions encoded. The logical question should have been why were his transmissions sent in plain language? Rather than spend millions of dollars to study and pass new legislation prohibiting this practice, change the practice and get a new security chief.

If the information contained in cellular telephone conversations is so valuable, encode them. We are talking about private enterprises using a national resource, the airwaves, which they do not own. This week, as I write this, several of the cable TV satellite companies are encoding their transmissions from their satellites. It is private enterprise protecting their investment. The folks who put up the dish antennas and bought satellite receivers will have a little less to watch now unless they want to buy or lease decoders. Oh, I'm sure that there will be a new market for decoders springing up in a few months (or less), but nothing's perfect. The same day that the encoding started with HBO, the FCC stated that communities could no longer legislate against dish antennas because of arbitrary reasons. Local communities are in a sense franchise holders of cable systems, and as such receive revenues from these cable companies. Keeping dish antennas out of a community removes "unpaid" competition. So, on one hand the government is saying to communities, "stay out of people's hair in regard to private enterprise. It's not okay for you to do it, but it's okay if we do it."

At the moment there's one government agency irked at our sister publication, *Popular Communications*, for printing a story and a list of their frequencies several years ago. Their premise was that we were making the information available to all sorts of nefarious individuals and groups in the controlled substance business. Well, that information was gathered over a few years by countless readers and sent in to us, as well as being printed and supplied by the government printing office. At the time we suggested that they change their frequencies and their codes, which were quite obvious to anyone listening. Here it is several years later and they are still at the same old frequencies and still using the same codes. I'm not sure who they think they are kidding. The people they are trying to apprehend can certainly afford many thousands of dollars worth of sophisticated equipment, far better than the average amateur or civilian, and turn around and junk it after one day's use.

The argument doesn't even come down to free speech, but rather one of a definition of what is trying to be accomplished. If one wants privacy, one encodes to the best of one's ability. There are plenty of laws on the books now as to what the consequences are if you were to use information gathered surreptitiously or maliciously interfere with any broadcast. Whether or not the government has the *right* to pass this type of legislation is a specious argument, but they certainly have the ability.

The fallacy in the logic or the error in the major premise is that there is a provable need for restrictive legislation. The only rationale or justification for such legislation is to overcome or cover-up blatant ineptness on the part of private enterprise and the government. Contrary to popular spy novels, TV shows, and super-patriotic, bigger-than-life movie heroes, a lot of real people and real governments still do dumb things that they wish you'd never find out about.

So whether or not amateur radio is exempted from this legislation cannot be the issue. It's only a beginning, for sooner or later information will get out in some form of media or publication. At that point the choice becomes do we (as a nation) become more restrictive and repressive, or at whatever this stage happens to be, do we change the system. If someone wants to listen in on some inane cellular phone conversation and go through the trouble of tracking it from cell to cell, who cares? Those of you who are into boating have listened in on ship-to-shore phone calls for years. Some are quite funny. It's all there in plain language for anyone to hear. The proposed solution or solutions will not do anything either to stop a person's curiosity or stifle their ingenuity. The American public is, in fact, being punished for finding out that the Emperor has no clothes. It's far easier to put clothes on the Emperor than to punish the whole population.

Does a person have a reasonable right to expect privacy when using a cellular mobile telephone or a conventional mobile telephone or even a ship-to-shore telephone? Not really. If you want absolute privacy via a non-transmitted path, then stop somewhere and use a public pay phone. It will be private, at least from your end. There are a few companies out there who are now marketing mobile scramblers for car phones, so at least a few folks do see the problem for what it is and are trying to satisfy a need. Does all of this secrecy need new and yet undreamed of technology, years of R&D, field-tested new hardware? No, it's all there right now if anyone wants to use it. In a way it's sort of an abstract continuation of RFI legislation. Most of the problems could be resolved at the point of manufacture for a dollar or two. That's all it would take to manufacture a susceptible device that isn't susceptible to RFI. For over 40 years now there have been hearings on RFI, RFI complaints, and a lot of unhappy people, but still the onus for RFI does not lie where it belongs.

The cable TV people finally saw the logic to scrambling their signals rather than trying to create legislation to help them out. It's the simplest and most direct method of restricting random access to proprietary information. Otherwise the information is simply there. You want to listen in on a phone call or eavesdrop on the President? Why not?

If the government, our government, wants to enact more legislation that cannot be enforced, we might owe it to ourselves to let them. However, even if amateur radio is excluded from this latest round of legislation, you might want to ask yourself how far the government can go in the name of protecting both themselves and private enterprise. If it isn't us this time, then when? Is what is being asked to be protected worthy of protection? Who gains? Who loses, and what do they lose for this so-called protection? A spy is still a spy whether the information comes from the airwaves or from a trash bin. However, if the transmitted information is sent in plain language and not scrambled, or the "secret" is taken from a crumpled piece of paper carelessly tossed away, then the system too is culpable and has no reasonable right to expect privacy. If you expect privacy, you send a letter in a sealed envelope; you don't send a postcard and expect no one to read it except the addressee.

Most of us got our start in amateur radio via the SWL route. We were curious as to what was out there. There is probably an equal or greater number of people out there who continue to SWL with no thought of ever becoming an amateur. They just like to listen in. There are those who will listen in occasionally simply because their radio has SWL bands and they tune around to escape boredom. Whatever the reason people listen, they will continue to listen no matter what legislation dictates. The equipment is out there in great proliferation and will hardly dry up or go away. If anything, people will now become more curious—sort of a "forbidden fruit" thing. So now that more people know it's possible to hear the President, more people will try to listen in. It's like telling someone to close his eyes, sit back, and don't think of an elephant. What happens?

I think that the concept of an insidious "Big Brother" who is out to control what we listen to is giving the powers that be a little bit more credit than they deserve. I think that somewhere along the bureaucratic line people stopped looking for basic solutions to problems and may have even lost the ability to think out a situation without the aid of a committee or data bank.

73, Alan, K2EEK

Say You Saw It In CQ

TOO GOOD TO BE TRUE?

PAKRATT™ Model PK-64

shown with enhanced
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In Packet mode, the PK-64 offers virtually all the features of every other Packet controller on the market, plus many important features left out by others due to cost constraints. For example, we have included a hardware HDLC, true Data Carrier Detect (DCD), multiple connect with up to ten stations simultaneously and full implementation of version 2.0 of the AX.25 protocol.

Because the PK-64 was designed specifically for the Commodore 64 (or C-128 and SX-64) computer, we have been able to do many things not economically feasible with general RS-232 interface controllers. For example, the Pakratt includes true split screen operation with on-screen status indicators and an on-screen tuning indicator.

ENHANCED HFM-64 MODEM OPTION

The standard PK-64 will operate all modes with a phase-lock-loop (PLL) detector roughly equivalent to all popular packet modems in the marketplace (except we have included extra filtering). The enhanced HFM-64 modem option offers true independent dual channel filtering with A.M. detection (like the famous CP-100 Computer Patch™). The enhanced HFM-64 option also offers a hardware LED tuning indicator (like the CP-100) and a front panel variable threshold control for setting maximum sensitivity under various band conditions. We recommend the HFM-64 option for anyone keenly interested in weak-signal heavy-QRM HF operation. For anyone desiring to operate FM RTTY with the standard North American tone pair or CW receive, the HFM-64 is required. The HFM-64 is field installable with no soldering or test equipment required.

WORKS WITH THE POPULAR C-64 COMPUTER

AEA designed the PK-64 around the low-cost C-64 because of the special architecture features making it especially suited to Amateur Radio applications. The C-64 should not be viewed as a mainframe, but rather a very economical accessory to your data communications system. Many owners of expensive computers such as IBM, TANDY, APPLE, KAYPRO, ATARI, etc., are now buying the low cost C-64 and dedicating it to their operating position. They simply cannot find software for their machine that even approaches the power and user friendliness of the PK-64. Plus, think of the convenience of having only one controller and keyboard to go from one mode to another without having to redo cabling!

The PK-64 is so complete that all you need to do is wire up a microphone connector to the end of a cable (provided) and you are ready to go. There is no need to track down special terminal software, cabling or even a power supply. It all comes with the PK-64. So do not be the last on your block to own the most exciting new product in years. See the PK-64 at your favorite dealer or write for our specification sheet now.

Prices And Specifications Subject To Change Without Notice Or Obligation

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CIRCLE 12 ON READER SERVICE CARD

Announcing

• **Dayton ARA 1986 Scholarships** - Two $1,000 scholarships will be awarded to two amateur radio operators this year. Any FCC licensed amateur graduating from high school in 1986 is eligible. There are no restrictions on the students course of study. Awards will be based on a combination of financial need and academic accomplishment with consideration given for service to amateur radio and community involvement. Applicants are not restricted to those preparing to pursue four year baccalaureate degrees. Those working toward associate degrees or planning to attend an accredited trade or technical institution will also be considered. To emphasize the importance of organized radio clubs to amateur radio, comments and or recommendations of an officer of the applicant's local radio club are also requested. Applications from young amateurs in areas without radio clubs will still be accepted when signed by a licensed amateur. All entries must be postmarked no later than May 15, 1986. Awards will be announced on or about June 1, 1986. For information and application forms write to: DARA, Box 44, Dayton, Ohio 45401, Att: Scholarship Committee.

• **The Alamo, San Antonio, Texas** - Commemorating the Battle of the Alamo and the 1986 Texas Sesquicentennial, a special-event station will operate from the Alamo, March 1–2. Primary frequencies: 14.280 and 7.235. Special QSL via Barry Brewer, WA5DTK, P.O. Box 65, Randolph AFB, TX 78148.

• **W5SC From San Antonio, Texas** - W5SC will celebrate Texas Independence Day on March 2 from 0600Z to 0600Z; 10, 15, and 20 meters, lower portions of the General CW and voice bands, conditions permitting. QSL, no. 10 envelope, SASE: W5SC, 90 Brees Blvd., San Antonio, TX 78209.

• **Fulton, Missouri** - Sir Winston Churchill delivered his "Sinews of Peace" speech on the campus of Westminster College in March 1946. To commemorate the 40th anniversary of this event, Callaway Amateur Radio League will operate KSØM from the Sir Winston Churchill Memorial on the Westminster College campus on March 9 from 1400 to 2200Z. Frequencies: 7.235, 14.235, 21.310 phone, and 14.050 CW ± QRM. Special QSL for SASE to C.A.R.L., P.O. Box 241, Fulton, MO 65251.

• **Marysville, California** - The Yuba-Sutter ARC will operate K6HDE to commemorate the 106th annual festival in honor of Bok Kai, the Chinese water god. Operation will be from 1600 to 2400 UTC March 15 on the low end of the General phone bands on 40 and 20 meters and on 147.54 MHz simplex. For certificate, send QSL and SASE to K6HDE, c/o YSARC, P.O. Box 1169, Yuba City, CA 95992.

• **Amateur Radio Classes** - Chelsea, Massachusetts Civil Defense will sponsor amateur radio evening classes at Chelsea High School starting March 18 for those interested in obtaining a Novice, or basic level ham license, or Technician/General license. Minimal cost will be charged for material only. For more information about amateur radio and classes, write to Frank Masucci, 136 Grove Street, Chelsea, MA 02150. Please enclose your phone number.

• **Bellmawr, New Jersey, Licensing Tests** - Examinations for all classes of amateur radio licenses will be given on the third Thursday of each month at 7 p.m. at the Bellmawr, New Jersey Radio Testing Center. For more info, contact Bill Helmetag, 214 Russell Ave., Barrington, NJ 08007, or call 609-546-7710.

• **KD7WS from Seattle, Washington** - Volunteers from several local ARC's will operate KD7WS from the 9th annual Northwest Science Fiction Convention (NORWESCON) from 1800Z to 0200Z for four days starting March 20. Demonstrations and speakers to introduce more young people to ham radio are also planned. Frequencies: phone—bottom 25 kHz of General phone bands; CW—bottom 30 kHz of General CW and Novice bands; RTTY—7.085, 14.090, 21.090; VHF via 146.96 repeater. Certificate for QSL and SASE via KD7WS, John V. Hedtke, 8729 Palatine N., Seattle, WA 98103.

• **Mercer County ARC** - The Mercer County ARC will hold its "How To" seminar on March 22 from 9:00 a.m. to 4:30 p.m. Topics will be presented on development of ham shack skills. License examinations (Novice through Extra class) will be given. Examinees and those under 18 years of age admitted free. For all others, admission is $2.00. Call in on 147.75/.15. Location will be Hermitage Middle School, route 18, Hermitage, PA. SASE to MCARC, Box 996, Sharon, PA 16146 for details.

• **The following hamfests, etc, are slated for March:**

March 2, **Mt. Tom Amateur Repeater Association Fleamarket,** Chicopee, MA. Contact MTARA, P.O. Box 3494, Springfield, MA 01101.

March 2, **Randolph ARA Hamfest,** Winchester, IN. Contact RARA, Box 162, Winchester, IN 47394, or Jake Life, W9VJX at 317-584-9361.

March 2, **Teays ARC Hamfest,** Circleville, OH. Contact Dan Grant, W8UCF, 22150 Smith Hulse Rd., Circleville, OH 43113 (SASE), phone 614-477-3026.

March 8, **Dalton ARC Hamfest,** Dalton, GA. Contact Dalton ARC, P.O. Box 143, Dalton, GA 30722-0143.

March 8, **Mike and Key ARC Electronics Fleamarket,** Puyallup, WA. Contact M&K Fleamarket, 20903 NE 77th, Redmond, WA 98053, or call 206-868-0457.

March 8, **Pacific Northwest Radio Amateurs Banquet,** Delta, B.C., Canada. Contact Dennis, K7GGP, at 671-6261.

March 8–10, **Orlando Hamcation,** Orlando, FL. Call 305-422-ARRL.

March 9, **Indiana Hamfest,** Indianapolis, IN. Contact Aileen Scales, KC9YA, 3142 Market Place, Bloomington, IN 47401 (SASE), or call 812-339-4446.

March 14, **Splitrock ARA Hamfest,** Morris Plains, NJ. Contact SARA, P.O. Box 3, Whippany, NJ 07981, or K2RF Repeater 146.395/146.985.

March 14, **Jefferson Barracks ARC Auction,** St. Louis City, MO. Contact Jefferson Barracks ARC, 1624 Union Rd., St. Louis, MO 63125.

March 15, **Auburn ARA Winterfest,** Auburn, NY. Contact W2NVQ, 34 Wegman St., Auburn, NY 13021 (SASE), or call 315-253-8830.

March 15, **Interstate Repeater Society Fleamarket,** Hudson, NH. Contact Richard Everhart, WB8YGR, 25 Briand Drive, Nashua, NH 03063, phone 603-889-3479.

March 15–16, **North Florida Ham/Swapfest,** Fort Walton Beach, FL. Contact Hud Huddleston, KF4BU, 925 Forest Ave., Fort Walton Beach, FL 32548, phone 904-862-2566.

March 15, **Midland ARC Swapfest,** Midland County Exhibit Building east of Midland, TX. Contact Midland ARC, P.O. Box 4401, Midland, TX 79704.

March 16, **WECAFEST '86,** Valhalla, NY. Contact WECAFEST '86, P.O. Box 348, Millwood, NY 10546.

March 22, **Shore Points ARC Springfest '86,** Egg Harbor City, NJ. Contact SPARC, P.O. Box 142, Absecon, NJ 08201.

March 22, **1986 Elizabethtown, Kentucky Hamfest,** Elizabethtown, KY. Contact Hubert Hensley, WD4GDA, P.O. Box 387, Vine Grove, KY 40175, or call 502-877-2234.

March 22, **Columbus, GA ARC Hamfest,** Columbus, GA. Contact Billy Bedgood at 404-323-5579, or write to CARC, P.O. Box 6336, Columbus, GA 31906.

March 22–23, **Charlotte Hamfest,** Charlotte, NC. Call 704-596-2168.

March 23, **Lake County ARA Hamfest/Computerfest,** Madison, OH. Contact LCARA Hamfest, 5261 Harmony Lane, Willoughby, OH 44094, or call 216-953-9784.

March 23, **Delaware Valley Radio Association Fleamarket,** Trenton, NJ. Contact KB2ZY, Box 441B, RD1, Stockton, NJ 08559 (SASE).

March 23, **Lamarsfest '86,** Grayslake, IL. Contact LAMARS, c/o Marc Abramson, P.O. Box 633D, Wheeling, IL 60090, or call 312-255-0642 after 8 p.m. CST M-F.

April 25–27, **Dayton Hamvention,** Dayton, OH. Call 513-433-7720.

IC-02AT

ICOM 2-Meter Handhelds

If you want a 2-meter handheld with exceptional features, quality built to last and a wide variety of interchangeable accessories, take a look at the ICOM IC-02AT and IC-2AT handhelds.

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IC-2AT

IC-02AT

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All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions. 02ATI084

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FM-X40 Series

FM-240 2 Meters
FM-740 70 cm

SPECTACULAR MOBILE SIMPLICITY

- Superior features, simpler to use for 2 meters, MARS, CAP
- Compact size for better fit in today's automobile
- 16 fully programmable memory channels, plus priority call channel, plus 2 VFOs for today's user
- Subaudible encode and decode standard for today's 2 meter bands
- Subaudible frequency programmed by freq, no chart needed
- Speech synthesis option for voice VFO
- Superior man machine interface—one knob and one button, program all of the features easily—alphanumeric LCD prompts
- 16 button speaker/mic with UP/DN lock-out switch
- VFO Steps Size—2.5-40KHz, programmable (× 10 with Speed on)
- Band Scan—Programmable limits and modes, CARRIER, AUTO & DELAY. Scan steps same as set for VFO steps.
- Memory Scan—Programmable modes, SKIP, CARRIER, AUTO & DELAY.

FM-240
Suggested Retail $369

FM-740
Suggested Retail $429

Limited time offer - Free MS-20 external speaker with purchase of FM-240 or FM-740. See your dealer now.

Specifications KDK FM-240 (and FM-740)	
General	
Supply Voltage	13.8v ± 15%, negative ground.
Consumption	Transmit: 1.5A @ 5w, 5.5A @ 25w Receive: .4A @ 0 sig., .6A @ max volume.
Temp. Range	– 10 deg. C to 60 deg. C.
Dimensions	40H × 140W × 170D mm (Body only)
Weight	1.0Kg (Body only)
Transmitter	
Freq. Range	FM-240 142.000 - 150.00 MHz (FM-740 440.00 - 449.975 MHz)
Output	High = 25 watts, Low = 5 watts (High = low, (Low = 1W) (FM-740 High = Low)
Modulation	Variable reactance frequency modulation
Max. Deviation	± 5KHz
Spur. Emmis	More than 60dB down from carrier
Duplex Offset	Programmable ± .1 to 12.7MHz (set at ± .6KHz ex-factory)
Tone	Programmable 74-250.3 (34 EIA tones) Encode and Decode
Receiver	
Int. Freq	1st = 10.7MHz, 2nd = 455KHz (1st-21.4MHz 2nd-455KHz)
Sensitivity	Better than 12dB SINAD @ .2uV
Squelch Sens	Better than .15uV
Bandwidth	+ 6KHz @ – 6dB
Selectivity	+ 12.5KHz @ – 60dB
Image Ratio	Better than 70dB
Audio Output	More than 2w, 8 ohms load, 10% THD
Standard Accessories	
Speaker Microphone	Speaker = 8 ohms, Mike = Condenser type. SM-34A: UP/DOWN plus tone encoder.
Power Cable	2 meters, with 7A fuse.

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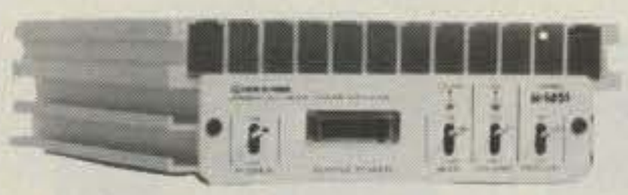
VHF AMPLIFIERS AND PREAMPS

HL-102V



220 MHz

HL-22V

220 MHz

HRA-2

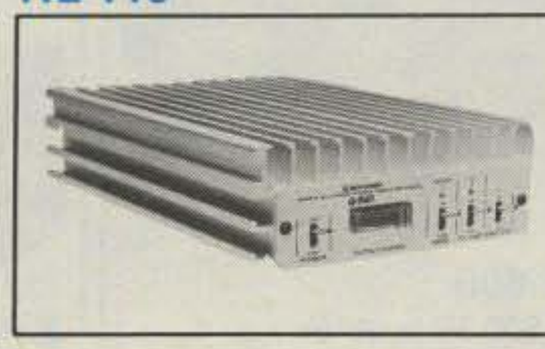
HRA-7

MODEL	HL-102V 220 MHz AMPLIFIER + PREAMP	HL-22V 220 MHz FM AMPLIFIER 20 WATT	HRA-2 MAST MOUNTED GaAsFET PREAMP 2 METERS	HRA-7 MAST MOUNTED GaAsFET PREAMP 70 CM
Sugg. Retail	$259.95	$99.95	$129.95	$129.95
Description	220 MHz all mode amp with low noise FET type preamplifier. 90 Watts out from 10 OR 25 Watts drive.	220 MHz VHF FM Amplifier GaAsFET Preamplifier	Mast mounted pre-amplifier using GaAsFET technology for lowest noise in the active device.	Mast mounted pre-amplifiers using GaAsFET technology for lowest noise in the active device.
Frequency Range	220-225 MHz	220-225 MHz	HRA-2: 2 Meters	HRA-7: 70 CM
Modes	SSB, CW, FM	FM	SSB/FM	SSB/FM
Supply Volts @ Amps	DC + 13.8V @ 18A	DC + 13.8V @ 5 AMPS	9–12 @ 200 mA	9–12 @ 200 mA
R.F. Power-Out (AVG)	90 W	20 W	GAIN: HRA-2 20 dB	GAIN: HRA-7 18dB
R.F. Power-In (NOM)	10 OR 25 W	3 W	Noise Fig.: HRA-2 1.0 dB	Noise Fig: 0.8 dB
Connector In/Out	TYPE 'M'	TYPE 'M'	TYPE 'N'	TYPE 'N'
Pre-amp Type	F.E.T.	GaAsFET	GaAsFET Semiconductor Helical Resonator	GaAsFET Semiconductor Helical Resonator
Output Meter Type	LIGHTED METER	L.E.D.	N/A	N/A
Dimensions	172W × 60H × 263D m/m	100W × 35H × 150D m/m	180W × 82H × 75D m/m	180W × 82H × 75D m/m
Weight	2.5 Kg	520g	550g	550g

VHF LINEAR AMPLIFIERS

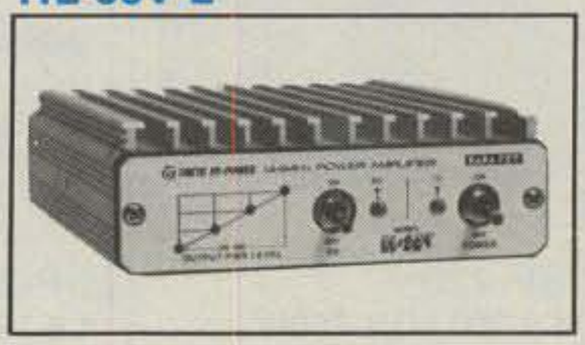
HL-160/V25

HL-110



HL-85

HL-35V-L



MODEL	HL-160V and HL-160V25 VHF 160W OUTPUT METER PREAMP	HL-110V VHF AMP 100 WATTS OUTPUT METER PREAMP	HL-85V VHF 80 WATT GaAsFET PREAMP METERING	HL-62V VHF SSB/FM AMP, GaAsFET PREAMP	HL-35V/L VHF FM/SSB AMP 25 WATT GaAsFET PREAMP
Sugg. Retail	$379.95 HL-160V $299.95 HL-160V25	$259.95	$189.95	$169.95	HL-35V $89.95 HL-35V/L $99.95
Description	144 MHz all mode amp with low noise FET type preamplifier. 160 Watts out from 3, 10, Watts with 160V (25 W 160V25)	144 MHz all mode with MOS-FET preamp	144 MHz all mode amp with low noise GaAsFET type preamplifier. 80 Watts Output with 10 W drive.	144 MHz all mode amp with GaAsFET type pre-amplifier.	VHF multi-purpose amplifier for SSB or FM. ECONOMICAL Best Buy in $/Watt with SSB capability and GaAsFET PRE-AMPLIFIER.
Frequency Range	144–148 (Export Available 150–160 MHz)	144-148 MHz	144–148 (Export Available 150–160 MHz)	144–148 MHz	144–148 MHz
Modes	SSB, CW, FM	SSB,CW,FM	SSB, CW, FM	SSB, CW, FM	FM(35V) FM/SSB/CW (35V/L)
Supply Volts @ Amps	DC + 13.8V @ 23A (V25: 22A)	DC + 13.8V @ 15 AMPS	DC + 13.8V @ 12 amps	DC + 13.8V @ 7.5 A	DC + 13.8V @ 4 Amps
R.F. Power-Out (AVG)	160W	100 Watts	80 Watts	60 W	25 Watts
R.F. Power-In (NOM)	3 or 10 (V25: 25W)	10 Watts	10 Watts	10 Watts	2.5 Watts
Connector In/Out	TYPE 'M'	TYPE 'M'	TYPE 'M'	TYPE 'M'	TYPE 'M'
Pre-amp Type	F.E.T.	MOS-FET	GaAsFET	GaAsFET	GaAsFET
Output Meter Type	LIGHTED METER	LIGHTED METER	LIGHTED METER		L.E.D.
Dimensions	218W × 82H × 299D m/m	172W × 60H × 263D m/m	172W × 60H × 184D m/m	150W × 45H × 164D m/m	100W × 35H × 150D m/m
Weight	3.5 Kg	2.2 Kg	2.0 Kg	1.2 Kg	520g

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WELZ CORP.

POWER METERS

SP-825
1.8-1300 MHz

SP-425
140-525 MHz

SP-225
1.8-200 MHz

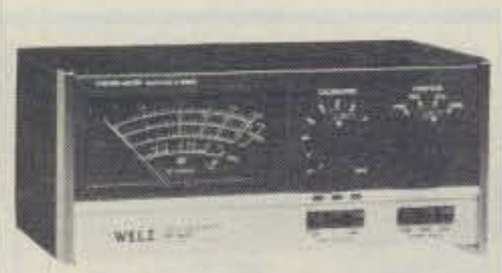
SP-122
1.6-60 MHz 2kW

Model	SP-825 AUTOMATIC SWR 1.8 - 1300 MHZ	SP-425 DUAL METER VHF/UHF	SP-225 DUAL METER HF/VHF	SP-122 HIGH POWER HF	SP-450 HIGH POWER VHF
Suggested Retail	$169.95	$119.95	$119.95	$89.95	$149.95
Freq Range	1.8-200, 430-450, 800-930, 1240-1300	140-525 MHz	1.8-200 MHz	1.6-60 MHz	140-470 MHz
Power Range (FWD)	2-15-150 W	5-15-150 W	5-15-150 W	20W-200W-2KW	50-300-1500W
(REF)	1-3-30	1-3-30 W	1-3-30 W		
Accuracy (FWD)	± 10% F.S.	± 7% F.S.	± 7% F.S. (160-200 10%)	± 10% F.S.	± 10% of Full Scale
(REF)	± 10% F.S.	± 10% F.S.	± 10% F.S.	± 10% F.S.	
SWR Sensitivity	SENSOR S-1: 2W; S-2:2W	2.5 WATTS	1 WATT	3 WATTS	30W
Insertion Loss	SENSOR S1:0.2 dB; S2:0.3 dB OR LESS	140-250: 0.1 dB 250-400: 0.2 dB 400-525: 0.3 dB	0.2 DB OR LESS	0.1 DB OR LESS	Less than 0.1 db
Available Measurements	AVG. PWR., TRUE PEP, SWR	AVG. PWR., TRUE PEP, SWR	AVG. PWR., TRUE PEP, SWR	AVG. PWR, SWR, PEP	AVG PWR, REF PWR, VSWR
Connector Type	S1: 'M' TYPE S2: 'N' TYPE	'N'	'M'	'M'	'N'
Indicators	LED, PEP-AVG. LED-SWR	LED, PEP-AVG. LED-SWR	LED, PEP-AVG. LED-SWR	LED, PEP-AVG. LED-SWR	
Power Required	DC 13.8V 400 mA	DC 13.8V 300 mA	DC 13.8V 300 mA	DC 13.8V 200 mA	NONE
Size	192W × 72H × 65D m/m	192W × 72H × 65D m/m	192W × 72H × 65D m/m	120W × 72H × 85D m/m	160W × 65H × 133D m/m (body)
Weight	1240g	850g	850g	680g	1.15 kg
Sensor Type	EXTERNAL TWO SENSORS	INTERNAL	INTERNAL	INTERNAL	EXTERNAL REMOTE

SP-220
1.8-200 MHz 200W

SP-230
1.8-150 MHz 750W

SP-600
1.8-500 MHz 2kW



SP-450 **140-500 MHz 1500W**

Model	SP-220 SINGLE METER HF 200W 1.8-200	SP-420 VHF/UHF SINGLE METER	SP-230 SINGLE METER HF 150W	SP-430 VHF/UHF SINGLE METER	SP-600 3 SENSOR HI-PWR 1.6-500
Suggested Retail	$59.95	$74.95	$49.95	$49.95	$159.95
Freq Range	1.8-200 MHz	140-525 MHz	1.8-150 MHz	140-150 MHz; 420-450 MHz	S1: 1.6-60; S2: 1.8-200; S3: 130-500 MHz
Power Range (FWD)	2-20-200W	4-20-200W	15W-150W	5 W - 60 W	S1: 20W-200W-2KW S2, S3: 20W-200W
(REF)					
Accuracy (FWD)	± 7.5% F.S. (2W: 5% F.S.)	± 10% F.S. or better	± 7% F.S.	± 7% F.S. or less.	± 10% F.S.
(REF)	FWD PWR AT 160-200 MHz: 15%				
SWR Sensitivity	1 WATT	1 WATT	2 WATTS	2 WATT	S1:1.5W S2:1W S3:2W
Insertion Loss	0.2 DB OR LESS	0.2 dB	0.2 DB OR LESS	0.2 dB	S1:0.1 S2:0.1 S3:0.25dB
Available Measurements	AVG. PWR., SWR PEP MONITOR	AVG. PWR., SWR PEP MONITOR	AVG. PWR., SWR	AVG. PWR., SWR	FWD PWR, REV PWR, VSWR
Connector Type	'M'	'M'	'M'	'M'	'M'
Indicators	LED, PEP-AVG, LED SWR	LED, PEP-AVG, LED SWR	LED, PEP-AVG, LED SWR VOLTMETER FOR CAR	LED FOR TRANSMIT, ON-AIR VOLTMETER FOR CAR	LED RANGE INDICATORS
Power Required for Lamps	DC 13.8V 300 mA		DC 13.8V 100 mA	DC 13.8V 100 mA	13.6 VDC FOR LIGHTS
Size	120W × 72H × 85D m/m	120W × 72H × 85D m/m	110W × 67H × 36D m/m	110W × 67H × 36D m/m	220W × 91H × 113D m/m
Weight	540g	540g	270g	270g	1.7 Kg
Sensor Type	INTERNAL	INTERNAL	EXTERNAL	EXTERNAL	INTERNAL

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SANTEC ST-20T

a SMART Radio... the INTELLIGENT Choice

	VHF FM TRANSCEIVER MODEL ST-20T	UHF FM TRANSCEIVER MODEL ST-40T
Suggested Retail	$349.95	Coming 1st Quarter 1986
Frequency Range	142.000 to 150.995 MHz	440 MHz to 449.975 MHz
Type of Emition	F3	F3
Memory Channels	10 Channels	10 Channels
Antenna Impedance	50 ohms	50 ohms
Power Source	9.6V Nicd battery pack 9V Dry battery pack D.C. 8.4-16V	9.6V Nicd battery pack 9V Dry battery pack D.C. 8.4-16V
Transmitter		
RF Output Power	5.0 Watts (H), nominal at 12V 3.5 Watts (H), nominal at 10.5V 0.5 Watts (L), nominal at 10.5V	3.0 Watts (H), nominal at 10.5V 0.5 Watts (L), nominal at 10.5V
Modulation	Frequency modulation	Frequency modulation
Maximum Deviation	± 5 KHz	± 5 KHz
Transmit Spurious	– 60 dB	– 60 dB
Microphone	Electret Condenser Microphone	Electret Condenser Microphone
Receiver		
Receiving Methods	Double superheterodyne	Double superheterodyne
I.F.	1st 16.9MHz 2nd 455KHz	1st 21.4MHz 2nd 455KHz
Sensitivity	Less than – 0.25uV at 12dB SINAD	Less than – 0.25uV at 12 dB SINAD
Band Width	± 7.5 KHz at 6dB down	± 7.5 KHz at 6dB down
Selectivity	± 15 KHz at 60dB down	± 15 KHz at 60dB down
Audio Output Power	400mW at 8 ohm	400mW at 8 ohm

Note: See Accessory List for ST-200 for Compatible Accessories.

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IC-2AT
IC-4AT

IC-3AT

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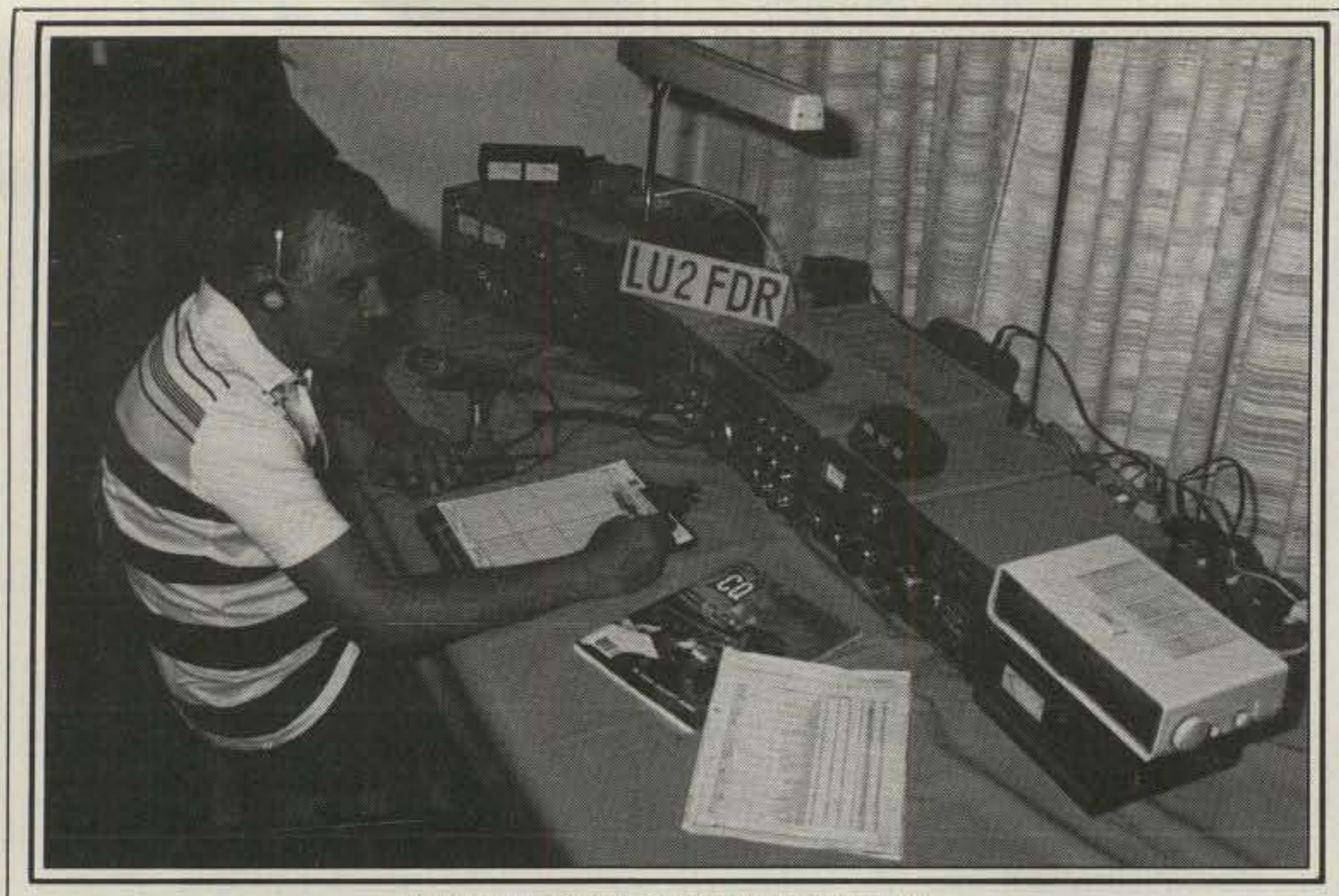
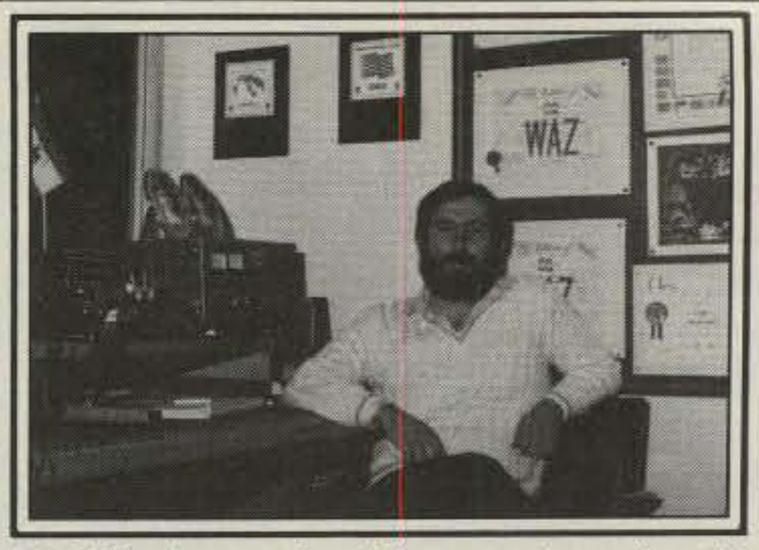
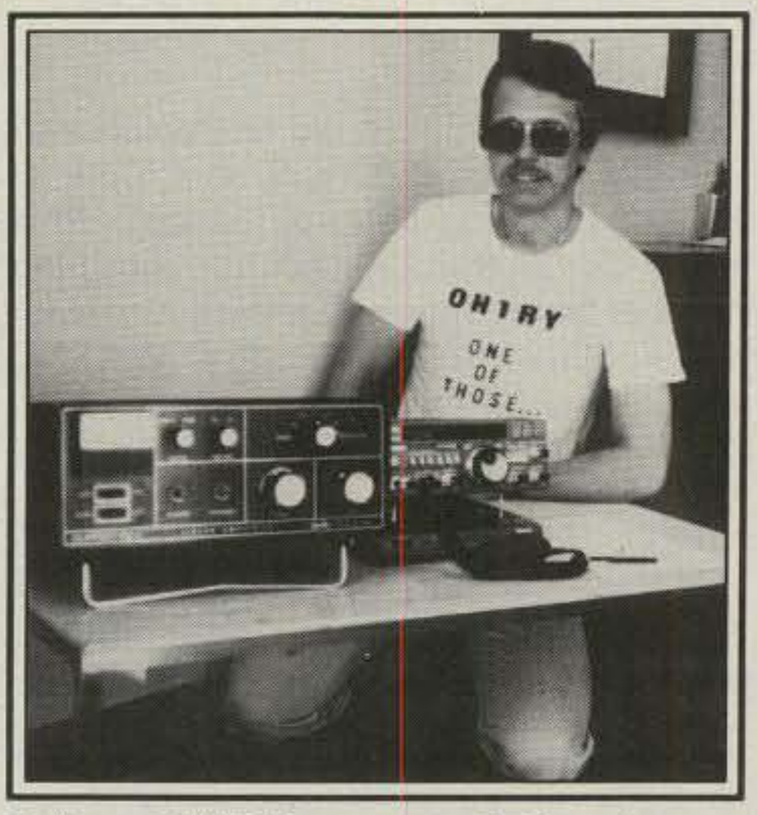


LU2FDR led the world on 21 MHz.



EA9IE relaxes after his record-setting all-band effort netted him 8.7M points.



Pekka, OH1RY, went to CT3 and more than doubled the previous world record on 3.5 MHz.

RESULTS OF THE 1985 CQ WORLD-WIDE WPX SSB CONTEST

BY STEVE BOLIA*, N8BJQ/6

The 29th WPX SSB Contest is history, and WPX contesters are gearing up for the last weekend of March 1986. The 1985 contest will be remembered as the year of the low bands, with new world records established on 40, 80, and 160 meters. With the proliferation of beam antennas, vertical arrays, and beverages, low-band scores have been increasing by leaps and bounds. Just a couple of years ago scoring over a million points on 40 or 80 meters was almost unheard of. However, in 1985 five stations on 40 and one on 75 topped two million. Increased interest in low-band DXing and the extra QSO points have made it profitable to upgrade the antenna system and pick up the extra points and multipliers available on the low frequencies.

There was quite a shuffle in the leader standings this year, with few returnees from last year. Juan, EA9IE, entered the WPX Contest for the first time, and his 8.7M points demolished the all-band record previously held by PJ2FR. Juan's 708 to 500 prefix advantage more than made up for the extra 90 QSO's made by number two finisher Carl Cook, AI6V/NH6. Carl did establish a new Oceania record with his 6.67M points, and won the new Oceania trophy sponsored by the Down Under DX'ers. Finishing third was Brooke Allen, N2BA, who went to VP2M and set a new all-band record for North America. Proving that a west coast station can win a contest, Gary Caldwell, WA6VEF, operated KI6P to a new USA record and world fourth place finish with 4.48M points. Nice job, Gary. To make the leader box required over 2.8M points compared to 2.3M in '84. Scores are still going up, even when conditions go down.

Four single-band records fell by the wayside during the weekend. North Americans accounted for three of them with John, CG3MFA, erasing EA9KF's 160 record; Yuri, VE3BMV, topping the 40 meter record set by T32AF last year; and Ray, KC5EA, at VP2EC easily shattering the 20 meter record. In what might be called escape from Finland, OH1RY/CT3 led a group of OH contesters on low-band expeditions. Pekka more than doubled the existing 80 meter record with 2.8M points. Steve, CZ3XO, and Bob, KQ2M, also broke the old record on their way to setting North American and U.S.A. records. On 40 meters last year's second- and third-place finishers moved up a notch and pushed the record higher. Yuri and Max, VF1CV, have a real battle each year for 40 meter honors with only 15,000 points separating them this year. On 160 meters John, CG3MFA, racked up 319,140 points, bettering EA9KF's year-old mark by more than 50,000 points. Number two man, EA8AFS, set a new African record with 282,048 points. Rick, K5UR, almost tripled WB3GCG's U.S.A. mark on 160 with 122,664 points, to finish up number four in the world. Although he did not set a record, Rubin, LU2FDR, easily captured 21 MHz honors with over 5 million points. Finishing second was last year's 10 meter winner, Ralf, CE6EZ. On 10 meters LU1E operated by LU3AJW found over 900 stations to work and picked up a world championship. Second place goes to VK8XX, who got a late start but still found enough JA's to keep him busy most of the weekend. The top QRP/p finisher was 4X6IF with 527,136 points, followed by UP2BIM.

World multi-single honors go to KD7P/NH4 operated by Bob Winters, KD7P, and Bob Smith, NA6T. Even though they made only a handful of European contacts, they did manage to make 4765 QSO's enroute to 10.48M points and a new Oceania record. In a close race for second place, IO5NPH edged out LZ2KTS by less than 15,000 points. Three of the top six multi-single entries came from Oceania, with AH2U finishing fifth and contest expedition trophy winner VK9XB (Christmas Is.) claiming the sixth

*c/o CQ Magazine

One of the unique prefix's available this year came from multi-multi station L2X. The ops were LU1CFV, LU1ANQ, LU2DX, LU1DJU, and LU7DEE.

spot. The new multi-multi champion also came from Oceania, with the crew at KH6XX breaking NP4A's record with a score of 24,898,239 points. Finishing number two is the new prefix record holder, ZZ5EG, who almost made it over 1000 with 992 prefixes worked, and 19.1M points. Rounding out the top five were WL7E, IO3MAU, and KL7IRT.

In the U.S.A., Jeff, KR0Y, used K4VX's antenna farm to take number two behind KI6P. Taking third was Ken, K6HNZ, with K3ZJ, AK1A, and K1YR all challenging. Less than 90,000 points separated positions four through six. With the exception of KI6P, single-op scores were down slightly from the previous year. Three single-band records were set over the weekend by KQ2M, K5UR, and KG1E. Bob, KQ2M, easily won the 80 meter category with an outstanding 1.24M score, with N5RZ taking second place. On 160, K5UR and KG4W each broke Willie's record, with K5UR coming out on top. On 20 meters KG1E broke K8NA's 1982 record with 2.9M points with N2AA, N2AU, and K2VV close behind. The top gun on 40 was Kurt, NI6W, who fell a little short in his attempt to break the U.S.A. record. On the quiet bands N4EJV worked them all to take 28 MHz honors and John, N4MM, did likewise on 21 MHz. The big signal in the QRP/p ranks goes to WD4NBX with 177,800 points, which was good enough for third in the world. The multi-single championship goes to the new Texas super-station put together by KN6M/5, with N4WW taking second place. In the multi-multi category, it was a battle of the fives with NF5I edging NM5L for the top spot.

Many thanks to the several expedition, DX, and special-prefix stations that helped to make the contest a success. CT0BI, KD7P/NH4, L2X, TE1W, OH1RY/CT3, OH1MA/CT3, OH2KI/ZB2, C44LP, TR1G, AI6V/NH6, W8KKF/V2A, HI0A, 3V8PS, DX1IYY, VK75A, and VK9XB are among the many who went out of their way to hand out a new band country or prefix to the deserving. For those who took the time to look, over 100 countries were on at various times, as well as 1000-plus prefixes.

In the unpleasant department one station was disqualified for not signing portable as required by rule VII. Also, several were disqualified for taking credit for QSO's where a complete exchange was not received. A correct exchange consists of the signal report and a serial number, not a signal report and the operator's name or QTH.

In the trivia department the 1969 record established by 9E3USA still stands as the oldest surviving WPX record. A total of 7 world records, 4 U.S.A. records, and 17 continental records were broken in the 1985 contest. See the current WPX SSB All-Time Records elsewhere in this issue. A new U.S.A. 14 MHz trophy sponsored by KR2Q has been added for the 1986 contest. If you win a trophy, please take a few minutes to thank the donor. It will be appreciated. Any individual or club interested in donating a trophy can contact me in care of *CQ* magazine. For a complete trophy list, see the January 1986 issue of *CQ*, or send to *CQ* magazine for a copy of the WPX rules. For those who wonder where the winners come from, four world champions come from North America, three each from South America and Europe, and two each from Oceania, Africa, and Asia.

Members of the Berlenga DX Group put on the first multi-multi operation from Portugal as CT0BI. Left to right are CT1AOZ, CT4NH, CT4UW, Patricio, and CT1BOH.

For those who have asked, computer-

TROPHY WINNERS

SINGLE OPERATOR - ALL BAND

WORLD - North Florida DX Assn. Trophy. Won by: **Juan Jose Rosales Fernandez, EA9IE.**
U.S.A. - Bob Epstein, K8IA Trophy. Won by: **Station KI6P operated by Gary Caldwell, WA6VEF.**
AFRICA - Southeastern DX Club Trophy. Won by: **Julio Vera-Cruz, D44BC.**
CANADA - Ed Sleight, K4SB Trophy. Won by: **Jim Roberts, CG3IY.**
CARIB/CA - Arturo Gigante, Jr., HI8GB Trophy. Won by: **Brooke Allen, N2BA/VP2M.**
EUROPE - Bernie Welch, W8IMZ Trophy. Won by: **Station YT3M operated by Joze Herman, YU3ZO.**
***JAPAN** - Palm Garden Radio Club Trophy. Won by: **Station JG1ZUY operated by Takeshi Kinsho, JH7PKU.**
OCEANIA - Down Under DX'ers Trophy. Won by: **Carl Cook, AI6V/NH6.**
SOUTH AMERICA - Ron Moorefield, W8ILC Trophy. Won by: **Dick Dorrance, PP2ZDD.**
WORLD QRPp - Dayton Amateur Radio Assn. Trophy. Won by: **Ralph Rosenbaum, 4X6IF.**

SINGLE OPERATOR SINGLE BAND

WORLD - John N. Reichert, N4RV Trophy. Won by: **Ruben Jaime Genera, LU2FDR.**
U.S.A. - Richardson Wireless Klub (Joe Johnson, W5QBM Memorial Trophy). Won by: **Alex M. Jozsa, KG1E.**
EUROPE - Myron E. Crofoot, WB4VQO Trophy. Won by: **Al Slater, G3FXB (14 MHz).**
U.S.A. - 7 MHz - William Diggins, WA8LXJ Trophy. Won by: **Kurt M. Andress, NI6W.**
***CANADA** - Gene Krehbiel, VE7KB Trophy. Won by: **Max Stagg, VF1CV.**
JAPAN - Ken Ruddock, K6HNZ Trophy. Won by: **Station JH3YJM operated by Yukio Ishibashi, JA4UDP.**
***JAPAN 28 MHz** - Joe Arcure, W3HNK & Toshi Kusano, JA1ELY (Terry Appleton, W4GSM Memorial Trophy). Won by: **Toru Katsuyama, JH1VTF.**
***WORLD 21 MHz** - Lee Wical, KH6BZF Trophy. Won by: **Ralf Hucke, CE6EZ.**
WORLD 7 MHz - William Diggins, WA8LXJ Trophy. Won by: **Yuri Blanarovich, CZ3BMV.**
WORLD - 1.8 MHz - Arch Doty, Jr., K8CFU Trophy. Won by: **John Summach, CG3MFA.**

MULTI-OPERATOR SINGLE TRANSMITTER

WORLD - Mike Badolato, W5MYA Trophy. Won by: **KD7P/NH4 operated by KD7P & NA6T.**

MULTI-OPERATOR MULTI-TRANSMITTER

U.S.A. - Burt Curwen, KL7IRT Trophy. Won by: **Station NF5I operated by W5XZ, W5WMU, N5AN, W0MJ, KZ5D, & W5ZR.**
WORLD - Henry Thel, VE7WJ Trophy. Won by: **Station KH6XX operated by KH6XX, KH6LW, KH6ND, KH6KV, KH6BZF, & KH6CJJ.**

CONTEST EXPEDITION

WORLD - Kansas City DX Club Trophy. Won by: **Station VK9XB operated by VK6IR and VK6DU** (Christmas Is.).

(The **World Club Competition** Trophy and the **U.S.A. Club Competition** Trophy winners will be announced with the CW results, as each is a combined SSB and CW award.)

**Denotes that trophy is provided by donor.*

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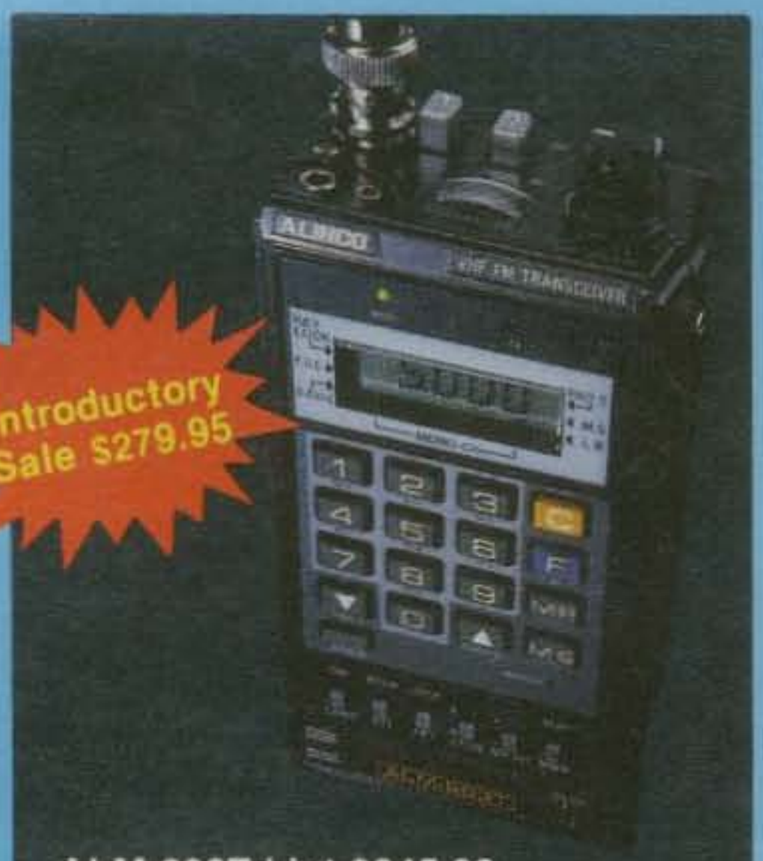

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ized logs are acceptable, and certainly make my work much easier. I am using two computers for log checking and data storage, and they certainly speed up things. If you do send a computerized log, please check your typing, and send along a note explaining the scoring. After looking at several thousand logs in the past few years, I still find some that I have trouble figuring out.

This year's contest will be March 29 and 30 (GMT). Please mail your logs to WPX SSB Contest, CQ Magazine, 76 N. Broadway, Hicksville, NY 11801. Logs sent to any other address may not reach us, or may arrive too late to count. If you would like confirmation of receipt, send along a post card with your log and I will return it as soon as I get the logs.

Thanks to all who took part this year, to the trophy donors and all who helped to make the contest a success. Special thanks to Contest Chairman, W1WY, for his invaluable help and to K4SB for his continued software support. Also, I must thank my wife who helps out sorting logs, helps with certificates, and puts up with a bedroom full of contest logs, computers, and radio equipment.

73, Steve, N8BJQ/6

Random Comments

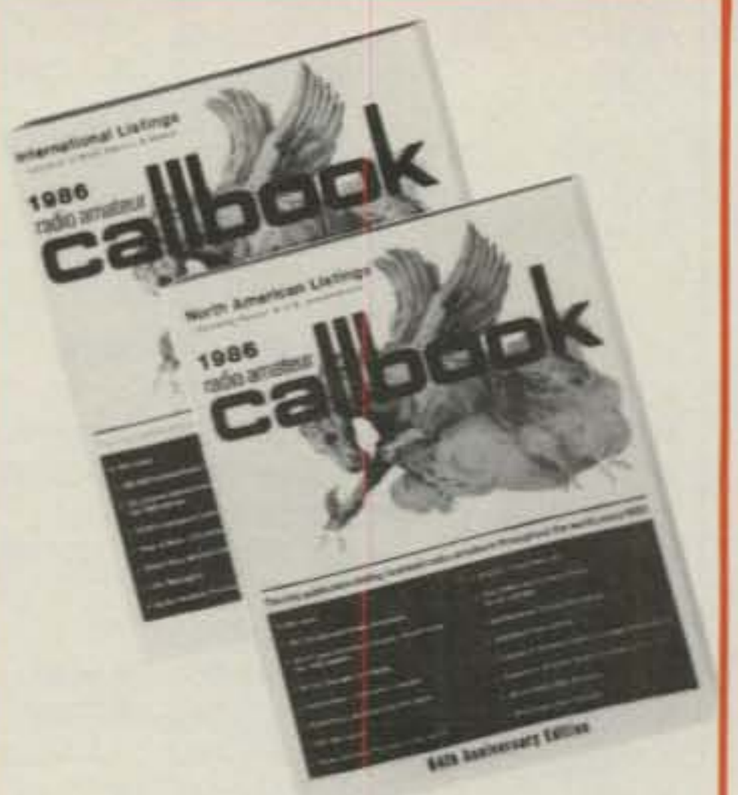
Having many people asking what country is KN5? . . . *KN6M/5*. One problem with guest operators—they like to eat! . . . *NO4J*. Lots of WPX endorsements should be forthcoming thanks to the U.S.S.R. . . . *N7TT*. Radios worked, amplifiers didn't blow up, antennas stayed up, rotor kept rotating, all in all it adds up to a great contest. Can't wait for next year . . . *NE8T*. BY4AA called us twice. They were a dupe the second time . . . *NS6X*. It can be challenging going at it with a tribander and wire antennas when condx are this terrible, but we had some fun and did fairly well . . . *AA5B*. One o'clock Saturday afternoon with the antenna on South America (15 meters). Lo and behold, A51PK long path. QSL via his brother, A51PK. Any slimmer and you wouldn't be able to see him! . . . *WB6ZHT*. Worked TR1G on 40 using 80 meter sloper. Wondered why I had to call so long! . . . *NN5E*. This is the 2nd contest for us. Our score went up 75%. WPX contest is a great contest . . . *NV4G*. After calling BY4AA numerous times OM (WA6R) turned mic over to XYL (KG6MO) and she nabbed him with one call. Disgusting . . . *KG6MO/WA6R*. Babysitting new grandson—tougher than doing the whole 48 hours. Should qualify for extra points . . . *W1BK*. My first all-band single-op. This contest presents a unique challenge . . . *K1YR*. Tremendous band conditions to all parts of the world, particularly Asia and Japan via polar path . . . *KG1E*. It is weird to break the 14 MHz record and not win. Good job KG1E . . . *N2AA*. Hurry up sunspots. Boy is 20 meter monoband a dog-eat-dog affair . . . *N2AU*.

Nice to have JT1BG call last five minutes of contest . . . *K3ZJ*. Condx on 20 superb even at my modest QTH . . . *N3BJ*. Thank God for 20 meters. Next year bigger antennas . . . *AI2C/4*. Band seemed to be open to south and the Pacific, but not too much activity . . . *N4EJV*. Best score yet. This is my third year . . . *AA4MM*. Age here is 79 and my first contest . . . *W6DNY*. Missed 15 mults because DX op's never listened up in the U.S. phone band . . . *NI6W*. Lost rotor on start of JA run . . . *W6RJ*. When the contest started, had a W and JA pile-up at the same time. In this one need 2 beams to catch the mults, but only have one—Hi . . . *KS7T*. Biggest thrill—having BY4AA answer my CQ. Never worked China before . . . *W7AYY*. My eleven-day-old daughter, Adrianne, helped me out during the early morning openings on 40 by keeping me awake . . . *KA7KDU*. Another great contest. Sure does bring a lot of good prefixes out . . . *AI8S*. It's fun to be a multiplier for a change . . . *KB9AW*. Lost my 40 meter ant. due to a heavy snow storm. Not funny . . . *KV0I*. Murphy crept into my computer logging program and messed everything up . . . *KC0XK*. Had a migraine headache all weekend. Listening to 40 over 9 static is not a recommended treatment . . . *N7DF/0*.

Thank you for good competition. Very many interesting stations with new prefixes . . . *SP9PEZ*. It did not go too well, but we will try again next year! . . . *ED1WPX*. It was so wet! Frogs were migrating off site! We enjoyed every minute. Back next year . . . *GM0AEE/p*. Propagation was very poor, enjoyed very much working for the first time the WPX contest . . . *LU1E (op. LU3AJW)*. 909 QSO's on 10 in 1981; 21 on 10 in 1985. That says it all . . . *PP2ZDD*. Very good contest, but no good propagation . . . *HK1HHX*. My transceiver caught fire at 2233 on 30/3, but I think this is not a funny story, is it? . . . *CX8CG*. Some station in Alaska called me 12 times on the same band! . . . *JG1ZUY (op. JH7PKU)*. Very few European contacts the whole contest. Would have cleaned house if we had Europe! . . . *KD7P/NH4*. We enjoyed running many JA's on 15, but there were so many strong stations in Hawaii . . . *WH6W*. This is a special station for International Youth Year. QSL via JR4QZH . . . *DX1IYY*. Why does it only rain and storm on contest weekends? . . . *YB5AQD*. Where were those thousands of prefixes from the stateside? Never the less, I did enjoy the contest very much! . . . *YC0DNK*. Having the flu meant I couldn't keep going in this test. Just didn't have the energy to fight it out . . . *VK2WU*. The first in and last out signal from the USA was NM5L. Would like to know what his QTH and antenna system was . . . *VK8XX*. Power was from a 12 volt car battery. It's a bit cramped operating from the driver's seat of a car, with the logs on your lap . . . *VK2PWS*.

Much fun—fun—great fun—lots of fun. My thanks to all . . . *AI6V/NH6*. It's a very nice contest . . . *YC0EMJ*. First major contest. Very enjoyable. 10 meters single band = frustration . . . *ZL1JE*. It was a nice surprise to see in the WPX so many hams as the CQ WW DX and so good conditions. It was a very exciting contest that I will try to do every year as a single operator . . . *EA9IE*. It was very nice to work contest in a different conditions than from Finland. Almost 500 stateside stations were worked; meanwhile, the best competitor in Finland did work only three . . . *OH1RY/CT3*. A neighbor with antennas over 100' high worked a steady pile-up on several bands with stations I couldn't hear. A humbling experience . . . *WL7AME*. Worked ZL1ANJ from both home QTH and Antigua in contest on 21 MHz . . . *W8KKF/V2A*. Best year ever in the phone portion (who needs the high bands?). Twenty meters during daylight was the best I can remember into Europe . . . *CG3IY*. I challenge anyone to say CG3CRG phonetically 10,000 times and not be changed by the experience . . . *CG3CRG (Op. VE2ZP)*. Sleet and ice storm, lightning, all helped to keep me uneasy and off the air for latter few hours of contest . . .

1986 CALLBOOKS



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K6HNZ	2,274,965	K1VUT	1,360,866
K3ZJ	2,089,552	KJ9D	1,300,336
AK1A	2,037,582	AI8S	1,235,426
K1YR	2,001,580	A12C/4	1,216,152

28 MHz

N4EJV	8,778	N4MM	83,248
WD8PAQ	528	N4BP	70,742

21 MHz

14 MHz

KG1E	**2,906,676**	**NI6W**	**972,890**
N2AA	2,373,735	AG9S	146,286
N2AU	1,764,720	N2BOW	68,364
K2VV	1,635,711	KA0IQR	67,064
WB5VZL	1,595,568	NJ8N	59,452
N8II	1,272,866	KB0C/9	57,380

7 MHz

3.7 MHz

KQ2M	1,247,906	K5UR	122,664
N5RZ	428,542	KG4W	74,112
K9ZO	299,464	AA4MM	48,348
KN8R	247,456	KA1SR	37,204
W6RJ	163,090	N4NX	23,980
KS9U	163,016	N7DF/0	19,592

1.8 MHz

QRP/p

WD4NBX	A	177,800	KB7M	21	1,105
W6YVK	A	30,208	W6CN	14	35,772
N8CQA	A	12,604	W6YMH	14	11,592

MULTI-OPERATOR SINGLE TRANSMITTER

KN6M/5	4,390,841	NE8T	2,902,345
N4WW	3,703,072	NS6X	2,767,674
KW8N	3,646,552	KI1G	2,418,715
NO4J	3,182,366	NB6L	2,407,986
N7TT	2,945,792	AA5B	1,761,984

MULTI-OPERATOR MULTI-TRANSMITTER

NF5I	**4,698,360**	KJ6V	376,200
NM5L	4,568,232	K5NA/2	301,570
NO5Q	1,203,488	K6XO	211,200

Gary, WA7GVM, was tops in the U.S. 7th district on 14 MHz.

WORLD TOP SCORES SINGLE OPERATOR

ALL BAND

EA9IE	**8,744,508**	YT3M	3,546,244
AI6V/NH6	**6,677,500**	CT1BCM	3,262,808
N2BA/VP2M	**5,626,512**	CG3CRG	3,009,270
KI6P	**4,483,792**	**D44BC**	**2,988,545**
CG3IY	**4,437,293**	CG3XN	2,937,504
AH8A	4,284,536	TR1G	2,873,938
CG5RA	3,750,521	VP2MBA	2,830,999

28 MHz

LU1E	907,128	**LU2FDR**	**5,364,483**
VK8XX	476,710	**CE6EZ**	**3,576,551**
YV6BTF	198,990	LU4LAV	2,654,106
LU1VK	51,520	YC0DNK	2,079,090
ZS6CDJ	45,962	YC0DPO	2,012,400
JH1VTF	**19,404**	ZL1ANJ	1,753,825
JO1CRA	13,300	ZY5BI	1,481,935

21 MHz

14 MHz

VP2EC	5,011,668	**CZ3BMV**	**3,397,962**
G3FXB	3,390,363	**VF1CV**	**3,384,648**
KG1E	2,906,676	FM5CD	3,163,156
OK3CSC	2,857,755	OH1MA/CT3	2,775,020
GW4BLE	2,697,634	TE1W	2,037,752
C44LP	2,467,900	OH2KI/ZB2	1,954,210
N2AA	2,373,735	YU3EY	1,539,456

7 MHz

3.5 MHz

OH1RY/CT3	2,816,754	**CG3MFA**	**319,140**
CZ3XO	1,329,840	EA8AFS	282,048
KQ2M	1,247,906	VE3OME	162,798
HA8IE	639,744	K5UR	122,664
YV6CAX	610,844	RA9AKM	79,074
EA8ANT	539,184	YU3MM	75,060
OH2JA	501,696	KG4W	74,112

1.8 MHz

QRP/p

4X6IF	**A**	**527,136**	YU1NR	14	106,920
UP2BIM	A	408,152	JK1RJQ	7	4,030
4M7QP	28	18,942	OK1AIJ	3.5	2,380
NP4KA	21	544,808	RA3DKE	1.8	10,384

MULTI-OPERATOR SINGLE TRANSMITTER

KD7P/NH4	**10,484,712**	RL8PYL	6,049,350
IO5NPH	9,504,126	HG5A	5,953,426
LZ2KTS	9,489,510	UP1BZZ	5,855,072
NP4CC	7,771,713	HG9R	5,430,470
AH2U	7,576,045	ED8RCT	5,382,780
VK9XB	**6,539,040**	GB2PX	4,967,865
OH8AA	6,460,344	HG6N	4,956,000

MULTI-OPERATOR MULTI-TRANSMITTER

KH6XX	**24,898,239**	CT0BI	5,286,120
ZZ5EG	19,121,792	**NF5I**	**4,698,360**
WL7E	11,639,033	NM5L	4,568,232
IO3MAU	11,216,183	VE7ZZZ	4,149,428
KL7IRT	8,446,100	JA7YFJ	3,977,820
GB4ANT	6,848,424	L2X	3,700,236
JA9YBA	6,819,066	I2MQP	2,703,578

CG3XN. The first night the preamp in my rig quit, but to even things out my amplifier quickly followed suit. Who wants to be known as an alligator? . . . *VY1CC*. Still many who don't know where VY1 is . . . *VY1CW*.

Hard to concentrate on contest with nice spring weather outside . . . *CG1ANH*. Good QRM is when BY4AA starts calling CQ contest right on top of you. Thanks, Tom . . . *CG7EIK*. Wind and ice storm destroyed my beam on Sunday afternoon . . . *CZ3NBE*. Low bands are getting busy. Super Contest . . . *CZ3BMV*. Last year over 2 million. This year over 3 million. Who knows what next year will bring—maybe a bigger beam and over 4 million . . . *VF1CV*. I was glad to work some new countries with my contest special HI0 . . . *HI0A*. Many strong signals from EU and U.S.A. heard on 20M, but very hard to get thru . . . *OX3OA*. I love this contest. Time off makes it civilized . . . *N2BA/VP2M*. Nice to see China in a contest . . . *WL7E*. Thanks for nice contest . . . *UQ2GCW*. Contest was very interesting; many new countries for my DXCC. Big problem was cross-band because QRM from broadcasting is very strong . . . *UQ2GM*. Due to gale-force winds, had to keep the tower down to 40 feet (sometimes only 25). Really needs to be up at least 60 feet to clear local obstructions to the east. Those missed mults probably cost me a good placing . . . *GW4BLE*. Tnx for a nice contest. Fun to have so many multipliers to hunt for . . . *SM0KNV*. Is my first time in a contest. I think I have learned a lot in how to run my next one and improve my score . . . *ED4BVE*. Enjoyed it. Set personal record for contacts in any contest and picked up five new countries . . . *J40DC*. How about 104 countries in less than 29 hours . . . *SV1JG/SV9*.

Say You Saw It In CQ

THINGS TO LOOK FOR *(AND LOOK OUT FOR)* IN A PHONE PATCH

- One year warranty.
- A patch should work with any radio. AM, FM, ACSB, relay switched or synthesized.
- Patch performance should not be dependent on the T/R speed of your radio.
- Your patch should sound just like your home phone.
- There should not be any sampling noises to distract you and rob important syllables. The best phone patches do not use the cheap sampling method. (Did you know that the competition uses VOX rather than sampling in their $1000 commercial model?)
- A patch should disconnect automatically if the number dialed is busy.
- A patch should be flexible. You should be able to use it simplex, repeater aided simplex, or semi-duplex.
- A patch should allow you to manually connect any mobile or HT on your local repeater to the phone system for a fully automatic conversation. Someone may need to report an emergency!
- A patch should not become erratic when the mobile is noisy.
- You should be able to use a power amplifier on your base to extend range.
- You should be able to connect a patch to the MIC and EXT. speaker jack of your radio for a quick and effortless interface.
- You should be able to connect a patch to three points inside your radio (VOL high side, PTT, MIC) so that the patch does not interfere with the use of the radio and the VOL. and SQ. settings do not affect the patch.
- A patch should have MOV lightning protectors.
- Your patch should be made in the USA where consultation and factory service are immediately available. **(Beware of an inferior offshore copy of our former PRIVATE PATCH II.)**

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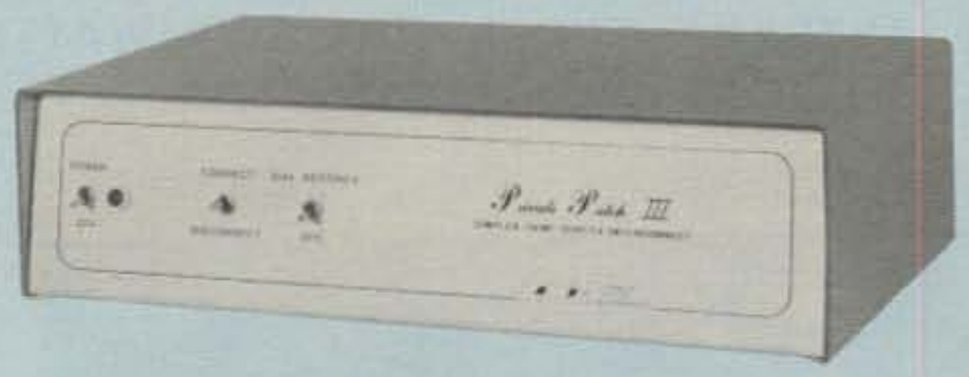
GIVES YOU ALL OF THE ABOVE

PRIVATE PATCH III
SIMPLEX SEMI-DUPLEX INTERCONNECT



The telephone is the most powerful mode of communications . . . PRIVATE PATCH III gives you full use of your home telephone from your mobile and HT radios!

With only three simple connections to your base station radio, PRIVATE PATCH III will give you more communications power per dollar than you ever imagined possible.

Suddenly the utility of your radio is drastically increased. There are new sounds . . . dial tones, ring tones, CW ID and the sound of voices you never expected to hear on your mobile or HT radio! What a convenience!

PRIVATE PATCH III frees you from memberships, cliques and other hassles common to many repeater autopatches. You can call who you want, when you want and for as long as you want. You can even receive your incoming calls!

VOX . . . the right choice!

VOX based phone patches offer many performance and operational advantages over the sampling method. These include operation through repeaters, compatibility with any radio, no lost words or syllables, greater range, smooth audio free of continual noise bursts, etc., etc.

Most amateurs are not aware that the competition's top of the line patch is VOX based. (You know . . . the $1000 model they enthusiastically call **"our favorite commercial simplex patch"** on page 3 of their SP brochure.)

PRIVATE PATCH III offers about the same capability, performance and features as their top model but is priced closer to their bottom of the line (SP) model!

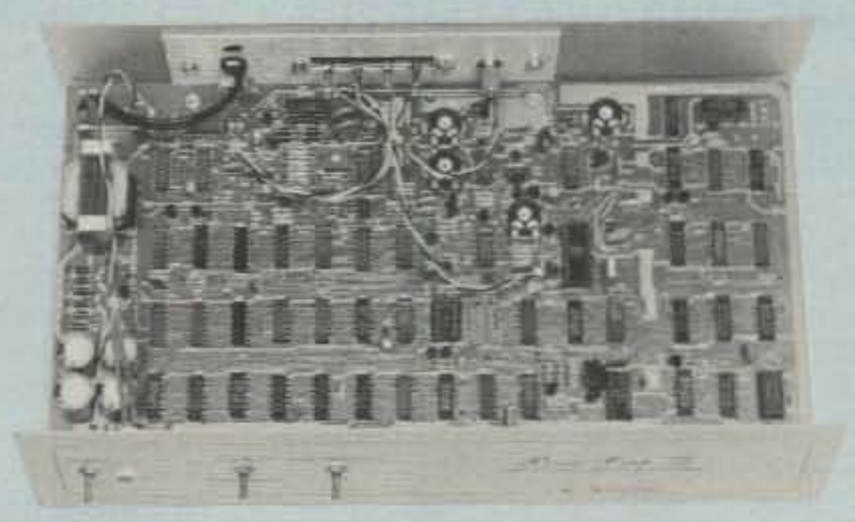
So why settle for SP when top of the line costs little more?

To Learn more about PRIVATE PATCH III and the advantages of the VOX concept, call or write for our four page brochure today!

PARTIAL LIST OF FEATURES

• OPERATES SIMPLEX, THROUGH REPEATERS, OR DUPLEX ON REPEATERS • VOX BASED • TOLL RESTRICT (Digit counting and programmable first digit lockout) **• SECRET CODE DISABLES TOLL RESTRICT FOR ONE TOLL CALL**—Automatic re-arm **• AUTOMATIC BUSY SIGNAL DISCONNECT • CONTROL INTERRUPT TIMER** (Maintains positive mobile control) **• CW ID** When you connect again on disconnect. Free ID chip. **• SELECTABLE TONE OR PULSE DIALING • MOV LIGHTNING PROTECTORS • THREE DIGIT ACCESS CODE** (e.g. ✱91) **• RINGOUT** (Reverse patch) Ringout inhibit if channel busy. **• RESETTABLE THREE MINUTE TIMER • SPARE RELAY POSITION • 115VAC SUPPLY**

Options:
FCC approved coupler
12 VDC or 230 VAC power



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New York, NY

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San Antonio TX

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Woodbridge, VA

ERICKSON COMMUNICATIONS
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Anaheim CA, Burlingame CA, Oakland CA, Phoenix AZ, San Diego CA, Van Nuys CA

HENRY RADIO
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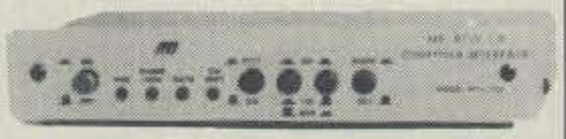
$99.95 MFJ-941D

NEW FEATURES

MFJ's fastest selling tuner packs in plenty of new features!
- **New Styling!** Brushed aluminum front. All metal cabinet.
- **New SWR/Wattmeter!** More accurate. Switch selectable 300/30 watt ranges. Read forward/reflected power.
- **New Antenna Switch!** Front panel mounted. Select 2 coax lines, direct or through tuner, random wire/balanced line or tuner bypass for dummy load.
- **New airwound inductor!** Larger more efficient 12 position airwound inductor gives lower losses and more watts out. Run up to 300 watts RF power output. Matches everything from 1.8 to 30 MHz: dipoles, inverted vee, random wires, verticals, mobile whips, beams, balanced and coax lines. Built-in 4:1 balun for balanced lines. 1000V capacitor spacing. Black. 11x3x7 inches. Works with all solid state or tube rigs. Easy to use, anywhere.

RTTY/ASCII/CW COMPUTER INTERFACE

MFJ-1224 **$99.95**



Free MFJ RTTY/ASCII/CW software on tape and cable for VIC-20 or C-64. Send and receive computerized RTTY/ASCII/CW with nearly any personal computer (VIC-20, Apple, TRS-80C, Atari, TI-99, Commodore 64, etc.). Use Kantronics or most other RTTY/CW software. Copies both mark and space, any shift (including 170, 425, 850 Hz) and any speed (5-100 WPM RTTY/CW, 300 baud ASCII). Sharp 8 pole active filter for CW and 170 Hz shift. Sends 170, 850 Hz shift. Normal/reverse switch eliminates retuning. Automatic noise limiter. Kantronics compatible socket plus exclusive general purpose socket. 8x1¼x6 in. 12-15 VDC or 110 VAC with adapter, MFJ-1312, $9.95.

RX NOISE BRIDGE

Maximize your antenna performance! **$59.95** MFJ-202B

Tells whether to shorten or lengthen antenna for minimum SWR. Measure resonant frequency, radiation resistance and reactance.

New Features: individually calibrated resistance scale, expanded capacitance range (±150 pf) Built-in range extender for measurements beyond scale readings. 1-100 MHz. Comprehensive manual. Use 9 V battery. 2x4x4 in.

INDOOR TUNED ACTIVE ANTENNA

NEW! IMPROVED! with higher gain

"World Grabber" rivals or exceeds reception of outside long wires! Unique **tuned** Active Antenna minimizes intermode, improves selectivity, reduces noise outside tuned band, even functions as preselector with external antennas. Covers 0.3-30 MHz. Telescoping antenna. Tune, Band, Gain, On-off bypass controls. 6x2x6 in. Uses 9V battery, 9-18 VDC or 110 VAC with adapter, MFJ-1312, $9.95.

MFJ-1020A $79.95

POLICE/FIRE/WEATHER 2 M HANDHELD CONVERTER

$39.95 MFJ-313

Turn your synthesized scanning 2 meter handheld into a hot Police/Fire/Weather band scanner! 144-148 MHz handhelds receive Police/Fire on 154-158 MHz with direct frequency readout. Hear NOAA maritime coastal plus more on 160-164 MHz. Converter mounts between handheld and rubber ducky. Feedthru allows simultaneous scanning of both 2 meters and Police/Fire bands. No missed calls. Crystal controlled. Bypass/Off switch allows transmitting (up to 5 watts). Use AAA battery. 2¼x1½x1½ in. BNC connectors.

MFJ/BENCHER KEYER COMBO

MFJ-422 **$119.95**

The best of all CW worlds- a deluxe MFJ Keyer in a compact configuration that fits right on the Bencher iambic paddle! MFJ Keyer - small in size, big in features. Curtis 8044-B IC, adjustable weight and tone, front panel volume and speed controls (8-50 WPM). Built-in dot-dash memories. Speaker, sidetone, and push button selection of semi-automatic/tune or automatic modes. Solid state keying. Bencher paddle is fully adjustable; heavy steel base with non-skid feet. Uses 9 V battery or 110 VAC with optional adapter, MFJ-1305, $9.95.

VHF SWR/WATTMETER

MFJ-812 **$29.95**

Low cost VHF SWR/Wattmeter! Read SWR (14 to 170 MHz) and forward/reflected power at 2 meters. Has 30 and 300 watts scales. Also read relative field strength. 4x2x3 in.

1 KW DUMMY LOAD

MFJ-250 **$39.95**

Tune up fast, extend life of finals, reduce QRM! Rated 1KW CW or 2KW PEP for 10 minutes. Half rating for 20 minutes, continuous at 200 W CW, 400 W PEP. VSWR under 1.2 to 30 MHz, 1.5 to 300 MHz. Oil contains no PCB. 50 ohm non-inductive resistor. Safety vent. Carrying handle. 7½x6¾ in.

24/12 HOUR CLOCK/ID TIMER

MFJ-106 **$19.95** *NEW*

Switch to 24 hour UTC or 12 hour format! Battery backup maintains time during power outage. ID timer alerts every 9 minutes after reset. Red LED .6 inch digits. Synchronizable with WWV. Alarm with snooze function. Minute set, hour set switches. Time set switch prevents mis-setting. Power out, alarm on indicators. Gray and black cabinet. 5x2x3 inches. 110 VAC, 60 Hz.

DUAL TUNABLE SSB/CW/RTTY FILTER

MFJ-752B **$99.95**

Dual filters give unmatched performance! The primary filter lets you peak, notch, low pass or high pass with extra steep skirts. Auxiliary filter gives 70 db notch, 40 Hz peak. Both filters tune from 300 to 3000 Hz with variable bandwidth from 40 Hz to nearly flat. Constant output as bandwidth is varied; linear frequency control. Switchable noise limiter for impulse noise. Simulated stereo sound for CW lets ears and mind reject QRM. Inputs for 2 rigs. Plugs into phone jack. Two watts for speaker. Off bypasses filter. 9-18 VDC or 110 VAC with optional adapter, MFJ-1312, $9.95.

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Station Operators
Multi-Operator Single-Transmitter

KN6M/5 & KE5CV, KY5N, AF5K, NA5S. **N4WW** & NX4N, KØLUZ. **KW8N** & KC8MK, N8DMM, N8ATR, N8DCJ, KB8MU, KV8M. **NO4J** & NU4Y, K4UTE, N4KE, KW4T, N4UF. **N7TT** & KE7V, KA2KRA. **NE8T** &N8CXX, N8BTU, KB8LM. **NS6X** & N6ADI, NE6I, AC6T, KB6IO, N6VR, N6HK, WA6FGV, WB6TNB, N6GUC, KA6VGP. **KI1G** & K1NG. **NB6L** & K6ZM, AK6T, WB6FCR, WB6MZQ. **AA5B** & K5TA, W5JW. **NR5K** & NF5J, K5MR, K5RR. **NU6S:** WB6KBZ, K6GSS, WA6AZP. **KMØL** & KØUAA, KAØQEX, KBØG, KBØWD, KCØHV, KMØE, NØCCX, NØCLV, WBØOIZ. **WC6I** & K6TMB, N6AUV. **NI2T** & N2CIC, N2FMA, KB2KW, KA2TIE, NE2W, WA3WKA. **KS9O** & NB9T, KA9DVY. **WB6ZHT** & N6HCS, WBØQPO, N2DHZ. **NN5E** & KC5DX. **KX1A** & W3AZD, WØMHK. **AAØA** & WØHBH, WDØFSJ, WDØGML, KBØKK, KAØDQI, KMØR. **NJ8G** & KD8NU, N9AG, WB8ENR. **KNØL** & KØHRF, NØAZ, KDØPO, KDØMD, WAØGBR, KAØCDW. **WD8QDQ** & WA9GQJ, WD8JAW, N8CYO, WR4T, KC8GG, KD8FT. **NV4G** & NU4B. **NJ8L** & K9ALP. **KG6MO** & WA6R. **KN7N** & KA7SRD. **KD5RW** & KA5DLM, KA5BOO. **KC7RN** & K7LXC. **WØCET:** KAØKAN, KAØSAM, KAØNYG, KDØUB, KØAJT, KSØU, WDØCVW, KDØEL, KCØIE & Son, WØMNR. **W3KWH:** AK3J, W3SVJ, WA3LKT, KA3LPB, WN3VAW. **WD6DJY:** KH6WZ, JA1IST/KB6BPS, KR6T. **W1BK** & K1TXH. **NP4CC** & KP4BZ, NP4Z, WP4C. **CG7UBC:** VE7CMK, VE7CNF, VE7FJE, VE7EWU, VE7DES, VE7FXV, Anthony. **CG4ALO:** VE4ALO, VE4VV.

ED8RCT: EA8ACH, EA8AGF, EA8AKN, EA8AKQ, EA8ARA, EA8AYE, EA8BJ, EA8QY, EA8RI, EA8VV, EA8ZS. **JE2YRD:** JA2EZP, JF2XJE, JJ2BBZ, JF6DEA. **5B4ES:** 5B4QL, 5B4OY, 5B4PB, 5B4OX, 5B4LD, Dimitris. **JA6YAI:** JR6GAG, JE6MQW, JE6UWI, JF6PPQ, JF6VFJ, JHØFKC. **JA2YKA:** JF2DQJ, JJ1BTC, JG2VTD, JJ2NJF. **JA7YRR:** JA7FDY, JA7JUD, JA7MQM, JA7MQO, JA7OWZ, JH7MEV. **IO5NPH:** I5NPH, I5MPN, I5SDG, IK5BAF, I8MPO. **LZ2KTS:** LZ2DF, LZ2PO, LZ2HE, LZ2CC, LZ1-A-310, LZ2-E-33, LZ2-E-41. **OH8AA:** OH6EI, OH8DD, OH8LP, OH8PF, OH8VJ, OH8NR, OH8ZZ. **HG5A:** HA5UA, HA5ML, HA5MK, HA5GF, HA5OM, HA5WE, HA5HO, HA7RY, HA7SU. **HG9R:** HA9PP, HA9PV, HA9RB, HA9RP, HA9RU, HA9RX. **GB2PX:** G3CWI, G3UKS, G3XTT, G3ZAY, G4BUO, G4FAM, G4JVG. **HG6N:** HA6ND, HA6ON, HA6NY, HA6NQ, HA6OQ, HA6NF, HA6NN. **GBØWAS:** G3KDB, G3LNS, G3NAS, G3NKS, G3NLY. **OH5NQ** & OH5LF, OH5NQ. **Y44ZI** & Y44UI, Y26DI/a, Y21JI, Y24RK. **ED7BB:** EA7CEC, EA7TH, EA7CFW, EA7EL, EA7FFA, EA7DFF, Jose Angel. **HB9CXZ** & HB9AGC, HB9AIB, HB9BAH, HB9BLQ, HB9CIP. **F6KAW:** F6BPX, F6DZS, F6BBO, F6EPY, F6IFR, F6CWN, F6HLC, F6HNQ, FD1JDS. **OK6DX:** OK2FD & OK2JS. OK7MM: OK3CQW, OK3CQA, OK3CDX, OK3CIW, OK3-27147. **YZ4Z:** YU4WFT, YU4WIA, YU4WRW, YU4WNW, YU4WTF, YU4WQR, Mario, Edwin. **4N7A:** YU7KV, YU7MIT, YU7QCN, YU7MIF, YU7RU, YU7XX, YU7MIX, YU7MIC, YU6WW, YU7ORF, YU7QFW.

YU2CRT: YU2OG, YU2MM, YU2QS, YU2DQ. **GBØWPX:** Leicestershire Contest Group. **EI7H:** Club Group. **YT3T:** YU3BQ, YU3HR, YU3EIJ, YU3DRW. **HG6V:** Simon, Suszter, Varga, Vingender, Bocsi, Dienes. **SK6TW:** SM6AOU, SM6CPY, SM6DER, SM6DOI, SM6DQO. **DLØWPX:** DF2ZN, DF2ZO, DK2XX, DK8ZL. **ED6MDX:** EA6MR, EA6MQ, EA6JW, EC6MR, EA6MS, EA6KZ. **IO9WPO:** IT9WPO, IT9RYJ, IT9UJU, IT9BKI, IT9QHW. **4U1ITU:** F6EXV, F6FYD, F6GFC. **IO3EJ:** I3EJ, I3OBO, IK3ACI, I3LDP, I3YXQ, IK3DHF, I3ASE, I3VJW, I3TUN, I3PQM, I3UBB, I3EHA, IW3EZI. **G6CW:** G4UUZ, G4NZU, G4WQN, G4UKN, G3TVY, G2SP, G4MHB, G4EKW, G4SGU, G6GZR, G4XOU, G4JSM. **HA7KLG:** HA7MY, HA7LD, HA7LC, Aniko. **HA1KRR:** HA1ZZ, HA1XU, HA1ZU, HA1XO, HA1DRM, Jozjef. **Y54ZA:** Y54TA, Y54UA, Y54VA. **Y32ZC:** Y32OC, Y32UC, Y32WC. **ED3CBE:** EA3BOX, EA3CVA, EA3DPU, EA3DGQ, EA3EIO, EA3BOW. **DLØJU:** DL7AKC, DL7AJU, DL7YS. **SP5PBE:** SP5BZA, SP5ELA, SP5FKW, SP5JTM. **LA4O:** LA4DCA, LA9HW, LAØBS, LB3HC. **OH2BAH** & OH2BAQ, OH2PR, OH2PQ, OH2BX, OH2-601. **DLØUE:** DL3LU & DL7BI. **DLØSB:** DF2AC, DL5AC, DK7AL, DF7BL, DL6AAA, DJØHD, DF6OZ, Walter, Ole. **IO6DKP:** I6DKP, DF7FH, DL4FF, DL7PD. **ED1AGN:** EA1AGN, EA1AGO, EA1YL, Marivi.

SP9PEZ: Silesian A.R.C. **HAØKHK:** Szabo, Toth, Mezo, Gorgyo. **HA6KNX:** 2 Oprs. **HA4KYH:** HA4XX, HA4YO, HA4YQ, HA4YK. **YO8KOD:** YO8DDP, YO8CHI, YO8CAR. **SP1KYB:** Kolobrzeski Radioklub. **OK1BB:** Club Group. **SK3AH:** SM3COL, SM3AFT, SM3CDW. **CT1BZN** & CT1CRZ. **ED1WPX:** EA1CTT & EA1CJJ. **GMØAEE/a:** GM4NNC, GM4TNJ, GMØAVB, GM6HWZ, GM1EOA, GM1EVL, 3 SWL's. **PI1GOE:** Club Group. **G3UOA:** G4IQS, G4JYE, G4WMH, G8CQH, Dr. P. Best. **OH7AI:** OH7BY, OH7EU, OH7KR, OH7SQ. **OK1KIM/p:** Club Group. **LA2AB:** LA2TAA & LA7VDA. PI4TTC: PAØIA, PAØFVH, PA2JMK, PA3AQE, PA3ASK, PA3CKY, PA3CTA, PA3DOX, PA3DUC, PDØOEK, PE1BMQ, NL8421, NL9343. **SP6ZFU:** Club Group. **SP1PBW:** Club Group. **SP9KOU:** Club Group. **SP9ZAS:** Club Group. **OK3KNS:** Club Group. **YU1AST:** Radio Club "Rade Koncar." **OK1KZD/p:** Club Group. **Y66ZF** & Y59VF, Y59UF. **OK1KQJ:** Club Group. **YO7KFE:** YO7BPN, YO7CYE. **OK3RDM:** Club Group. **HA7KMP:** Tama's, Janos. **OK1KCP:** Club Group. **OK1KUZ/P:** Club Group. **SP6KCN:** Club Group. **PI4AMF/A:** PA3BIX, PA3BOR. **HA3KGJ:** HA3GJ, HA3HF, HA3HZ, HA3FLK, HA3IS, HA3GQ. **OK2KPS:** Club Group. **KD7P/NH4:** KD7P & NA6T.

AH2U & KA7MLT. **VK9XB:** VK6IR, VK6DU. **KB6DAW/KH2:** KB6DAW, KA8GUS. **WH6W** & AH6GB, AH6GC. **DX1IYY:** JR4QZH, JH5IRT. **YB5AQD** & YB5AQC. **ZL2AH** & Peter Lypsley. **VK6EU/P** & Wesley Beck. **RL8PYL:** UL7PAE, UL7PAZ, UL7PCZ, RL7PAV, RL8PY, UL7-023-522, UL7-023-501, UL7-023-499. **EO9ACS:** UA9CJK, Andy, Mike, UA9CPB, UA9CDT. **EOØAAK:** UAØAGI, UAØABK, UAØAFQ, UA0-103-712, UA0-103-239, UA0-103-347. UZØCWA: UAØCB, UWØCA, UAØCGN, UWØCM, UAØCCD, UA0-110-300, UA0-110-297. **UL8AWE:** UL7-179-111, UL7AAC, UL7-179-141. **EU7L:** UL7-01899, RL7GN, UL7-01827. **EO9AUN:** UA9UHN, RA9UPG, UA9-130-1057. **EV9AW:** UW9WR, UA9WIT, UA9WFV, UA9WFJ, UA9WGM. **EO8M:** Club Group. **UI9BWF:** RI8BQ, UI8-053-841, UI8-053-844. **EU9H:** UH8HAI, UH8HAS. **UZ9SWR:** Vlad, Ian, Vadim, Ram, Dick. **UF7FWL:** UF6FHI, RF6FHZ. **UZ9WXH:** Alex, Vadim, Vitaly, Alex, Serge. **UZ9AWH:** UA9AE, UA9ACA, UA9-165-1458. **UZ9UZA:** Andrey, Igor, Vladimir. **UZ9OWD:** Valezy, Sergei P., Sergei S. **UZ9CXU:** RA9CVC, RV9CCD, RA9CSP. **UZ9OXI:** UA9-145-132, UA9OIU. **UM9MWO:** Club Group. UP1BZZ: UP2PAJ, UP2BIG, UP2BIL. **EU3A:** UV3GZ, UQ2GAG, UA3AOF, RZ3DX, UA3ANI. **ER3A:** RA3AA, RA3AF, UA3-170-559, UA3-170-339. **EM5T:** RT5UN, UB5RCA, UB5-065-494, UT5UGJ, UT5-186-86, UB5TAU. **UB4CWW:** RB5CB, UB5-080-70, RB5CW, UB5CCN. **UZ6LWZ,** UB5ITW, UA6LIG, UA6AUN, RA6LRT, UA6-160-1240, UA6-150-1070. **EU2P:** UP2BAS, UP2BNM, UP2BO, UA4HBW, UP2-038-1162, UP2-038-1236, UP2-038-1237, RP2BID.

EO5BIM: UB5IIA, RB5ID, UB5IFN, UB5-073-300. **EM4BMG:** Victor, Jorg, Miak. **UP1BZR:** UP2BDW, UP2BJK, UP2BOQ, UP2-038-346, UP2-038-728. **UP1BZG:** UP2BCO, UP2BCW, UP2BCT, UP2BOC, UP2QA, UP2-038-439. **EW2C:** Roman, Alexander, Serej. **EU1Q:** UQ2-037-83, UQ2-037-116, UQ2GLK. **UZ4HWS:** UA4HSV, UA4-133-941, UA4-133,2017. **EO1AZM:** UA1ZX, UA1ZA, UA1ZCM, UA4AZM, UA1-143-176, UA1-143-325. **EO2OGL:** UQ2GFU, RQ2GEE, UQ2-037-172. **EO5BED:** RB5EZ, UB5EPW, UB5ECX, UB5-060-86, UB5-060-65. **EU1R:** Club Group. **EO2R:** Club Group. **EW1AA:** UA3DPX, UA9QCQ. **UZ3DXW:** Club Group. **UT4UWK:** UB5XCM, UT5-186-152. **UB4QWW:** Club Group. **UZ6LZZ:** UA6LMT, UA6LQZ, UA6LLX. **EO3AQW:** UA3QA, UA3QGO, UA3QBX, UA3QML, UA3QMK. **EO5O:** Slawa, Harry, Oleg. UP1BWV: UP2MC, UP2BMM, UP2BLO. **EO3AWK:** RW3WW, UA3WCX, RA3WBY, RA3WA, UA3-135-101. **EMØCWN:** Victor, Vitaly, Svetlana. **UZ3TXL:** Nick, Pavel, Alexandr. **UQ1GXJ:** UQ2-037-437, UQ2-037-436. **UT4UWE:** UT5UDI, UT5UGI, UT5-186-158. **UB4IWB:** Valery, Yury, Gena. **EO5BQM:** RB5QD, UY5YY, UB5QDF, UB5QEH, UB5QMO. **UQ1GWB:** Club Group. **EW3A:** UA3AGW, UAØKCE, RW3AN, UA3ACV. **RB4IWK:** Alex, Nick. **UC1WWY:** Leon, Ivan, Dima. **UZ3AXH:** Club Group. **UT4UWG:** UT5UAW, UT5UAO, Victor. **EO3ATD:** Club Group. **UZ4HWZ:** Club Group. **EM8CCM:** UC2CAM, UC2CET, UC2-009-743. **UB4AXA:** UB5AKA, UB5-075-1101, UB5-075-1062. **UQ1GWX:** Club Group. **EMØCOR:** Yuri, Vlad. **UZ3XWH:** Gena, Victor, Sergei. **UZ3SWW:** Club Group. **UZ3DZQ:** Club Group. **EM1AA:** Club Group. **EO1AOS:** Club Group. **UB4WYA:** Club Group. **UZ6XWC:** Club Group. **UT4UWT:** UT5-186-129, UT5-186-85.

Multi-Operator Multi-Transmitter

KH6XX & KH6LW, KH6ND, KH6KV, KH6BZF, KH6CJJ. **ZZ5EG:** PY5EG, PY5CA, PY5ALP, PY5VM, PY5IW,PY5NW, PY2BW, PY2MIK, PY2FZ, PP5JD, PY1RR, PY5BAB, PY5YD. **WL7E** & KL7Y, NL7P, WL7Y, NL7G. **IO3MAU:** I3MAU, I3EVK, I3ON, I3JSS, I3FIY, IN3DYG, I3BYT, I3FJV, I3GRX, IV3TAE. **KL7IRT** & AL7L, AL7Z, AL7EN, AL7FG, AL7FQ, KL7BL, KL7ENY, KL7TC, KL7XD, KL7XO, KL7JJB. **GB4ANT:** G3MPN, G3LDI, G3JOC, G3VZT, G3ZIG, G4BWP, G4BTY, G4SDP, G4DRS, G4JQL, G4FKG, G4RKK, G4WTD, G4ODC, G4DYC, G3IOR, G8VLL. **JA9YBA:** JA9LNJ, JA9VBW, JA9VDA, JA9QCE, JH7UJR. **CTØBI:** CT4NH, CT1AOZ, CT1BOH, CT4UW. **NF5I:** W5XZ, W5WMU, N5AN, WØMJ, KZ5D, W5ZR. **NM5L** & K5LZO, NM5M, NT5D, KA5SBS, K2TNO, KD5SP, KE5IV, AK5B, WB5RUS. **VE7ZZZ:** VE7AV, VE7SK, VE7VX, VE7WWW, VE6EZ, VE7EPN. **JA7YFJ:** JO1HBF, JR7SLG, JE7HEG, JR7SOA, JH7QLO, JE7XTQ, JF7IUZ, JR7UOL, JE7JWU, JR7EFI, JR7MPT, JR7MRQ, JR7OPP, JE7AFP, JE7BIZ, JE7ENK, JE7HMC, JE7MKQ, JE7MTI, JE7RCC, JE7WQH, JF7DJD, JF7SWJ.

L2X: LU2DX, LU1DJU, LU7DEE, LU1ANQ, LU1CFV. **I2MQP** & I2AOX, I2UIY, I2VRN, I2VXJ, I4MMV. **UL8LWZ:** UL7LEZ, UL7LGA, UL7LO, UL7-026-177. **PI4DEC:** PAØLEG, PAØTUK, PAØZBL, PA2FAS, PA3AWW, PA3CJF, PA3CZW, PA3DEW, PA3DJL, PA3DKK. **EV4AW:** Orlov, Blinov, Krylov, Enoktaev, Nekrasov, Vasyliev. **UZØLWO:** UWØMF, UAØNL, UWØLT, UAØLD. **OK3KII:** Club Group. **NO5Q** & K5RVK, W5ASP, W5SJS. **VK75A:** VK3BRZ, VK3VU, VK3AWY, VE3BQZ, VK3CSR, VK3AKK, VK3YMW. **KJ6V** & NCDXC Net. **K5NA/2** & N2CYH, KU2Q, KY2J, KA2TIP, N2EGR, KA2QYL. **K6XO** & K. Brubaker, NCDXC Net. **JAØZAV:** JAØVHI, JAØOSV, JAØRUG, JAØTEN, JAØSWR. **JH1YTX:** Takeshi, Isami, Fumio, Tomonori, Tie, JM1JHG. **OZ4HAM:** OZ1DGP, OZ2JZ, OZ8IE, OZ4OW. **JA3YDS:** JI3GAB, JI3OPT, JR6DQH.

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CONTINENTAL LEADERS

AFRICA

AB	**EA9IE**	**8,744,508**
28	ZS6CDJ	45,962
21	EA8BFU	275,315
14	No Entry	
7	OH1MA/CT3	2,775,020
3.5	OH1RY/CT3	2,816,754
1.8	EA8AFS	282,048

ASIA

AB	**JG1ZUY**	**2,383,418**
28	**JH1VTF**	**19,404**
21	JR1WHW	129,778
14	C44LP	2,467,900
7	JA2BAY	487,287
3.5	UH8EAA	453,504
1.8	RA9AKM	79,074

EUROPE

AB	**YT3M**	**3,546,244**
28	IV3GOW	9,360
21	RB5IM	446,790
14	G3FXB	3,390,363
7	OH2KI/ZB2	1,954,210
3.5	HA8IE	639,744
1.8	YU3MM	75,060

NORTH AMERICA

AB	**N2BA/VP2M**	**5,626,512**
28	N4EJV	8,778
21	N4MM	83,248
14	VP2EC	5,011,668
7	**CZ3BMV**	**3,397,962**
3.5	CZ3XO	1,329,840
1.8	**CG3MFA**	**319,140**

OCEANIA

AB	**AI6V/NH6**	**6,677,500**
28	VK8XX	476,710
21	YC0DNK	2,079,090
14	ZL1AXB	1,927,842
7	No Entry	
3.5	ZL1BMU	297,600
1.8	No Entry	

SOUTH AMERICA

AB	**PP2ZDD**	**2,796,429**
28	LU1E	907,128
21	**LU2FDR**	**5,364,483**
14	PY4OD	1,237,740
7	ZP5JCY	1,480,752
3.5	YV6CAX	610,844
1.8	No Entry	

MULTI-SINGLE

AF	ED8RCT	5,382,780
AS	RL8PYL	6,049,350
EU	IO5NPH	9,504,126
NA	NP4CC	7,771,713
OC	**KD7P/NH4**	**10,484,712**
SA	No Entry	

MULTI-MULTI

AF	No Entry	
AS	JA9YBA	6,819,066
EU	IO3MAU	11,216,183
NA	WL7E	11,639,033
OC	**KH6XX**	**24,898,239**
SA	ZZ5EG	19,121,792

Number groups after call letters denote following: Band (A=all), Final Score, Number of QSOs, Zones, and Countries. Certificate winners are listed in Bold Face.

QRPp SECTION WORLDWIDE

4X6IF	**A**	**527,136**	**637**	**289**
UP2BIM	**A**	**408,152**	**585**	**326**
WD4NBX	**A**	**177,800**	**352**	**254**
YO6BGT	**A**	**45,234**	**194**	**126**
AH6EK	**A**	**39,897**	**141**	**93**
W6YVK	**A**	**30,208**	**163**	**128**
Y21XC	**A**	**25,760**	**144**	**112**
HK3IJM	**A**	**25,137**	**92**	**63**
N8CQA	**A**	**12,604**	**100**	**92**
WA3PTT/KL7	**A**	**11,640**	**76**	**60**
N8AXA	"	11,269	67	59
LA1XDA	**A**	**9,348**	**107**	**76**
VE7YU	**A**	**5,625**	**51**	**45**
WB9HRO	**A**	**3,901**	**51**	**47**
JH3LCU/1	**A**	**2,059**	**29**	**29**
UR2HB	**A**	**420**	**17**	**14**
EA3DNC	**A**	**63**	**9**	**7**
4M7QP	**28**	**18,942**	**101**	**66**
JH9HXF/1	**28**	**2,618**	**45**	**34**
JI3BFG	"	1,785	42	35
EA4CFN	**28**	**867**	**19**	**17**
EA3FHC	"	780	21	15
EA3ERT	"	75	6	5
NP4KA	**21**	**544,808**	**816**	**303**
ZS6PT	**21**	**89,082**	**209**	**147**
RB5GD	**21**	**25,844**	**112**	**91**
UY5XE	"	19,200	99	80
LZ2EW	**21**	**19,116**	**100**	**81**
JR7GYC	**21**	**18,954**	**108**	**81**
JA0BMS/1	"	8,178	69	58
YO5BQ	**21**	**3,663**	**41**	**37**
KB7M	**21**	**1,105**	**26**	**17**
YU1NR	**14**	**106,920**	**355**	**216**
JA2JSF	**14**	**86,652**	**221**	**166**
W6CN	**14**	**35,772**	**170**	**132**
W6YMH	"	11,592	88	72
KB7NV	**14**	**10,428**	**86**	**79**
VE2AEJ/3	**14**	**7,056**	**61**	**56**
SP4DM	**14**	**7,020**	**60**	**52**
UP2BB	**14**	**3,666**	**49**	**39**
UB5VAA	**14**	**3,471**	**41**	**39**
PA0NRD	**14**	**1,575**	**35**	**35**
JK1RJQ	**7**	**4,030**	**34**	**31**
RA1AL	**7**	**1,872**	**39**	**36**
UB5JNQ	**7**	**720**	**20**	**18**
OK1AIJ	**3.5**	**2,380**	**37**	**35**
JA1KFX	**3.5**	**1,260**	**23**	**21**
SP9EOG	**3.5**	**760**	**21**	**20**
RA3DKE	**1.8**	**10,384**	**84**	**59**
UA3ATV	"	4,472	63	43
RP2BIH	**1.8**	**24**	**4**	**4**

SINGLE OPERATOR NORTH AMERICA

UNITED STATES

AK1A	**A**	**2,037,582**	**1449**	**582**
K1YR	**A**	**2,001,580**	**1429**	**595**
K1VUT	**A**	**1,360,866**	**1144**	**478**
KD2EU/1	"	337,716	548	354
KA1EKR	"	94,446	201	162
W3SOH/W1	"	53,862	173	141
KC1F	"	45,760	185	143
W1WY	"	28,620	109	106
KG1E	**14**	**2,906,676**	**1972**	**614**
K1KJT	**14**	**661,132**	**762**	**394**
K1TR	"	259,374	386	278
AB1U	"	95,744	234	187
KA1SR	**1.8**	**37,204**	**283**	**131**
AD2Y	**A**	**418,950**	**615**	**350**
			(Op. N2DRR)	
KS2M	**A**	**281,892**	**395**	**278**
K2QF	"	55,704	150	132
KB2SE	"	48,870	153	135
W2DW	"	47,520	173	144
KW2J	"	42,120	164	135
WB2DND	"	40,544	130	112
KA2VAJ	"	39,308	145	124
WB7DLI/2	"	23,655	106	95
KT2D	"	8,990	70	58
WB2DIN	"	2,048	32	32
N2AA	**14**	**2,373,735**	**1648**	**555**
N2AU	**14**	**1,764,720**	**1251**	**540**
K2VV	**14**	**1,635,711**	**1265**	**511**
KF2O	"	190,176	318	224
WB2PXA	"	12,000	87	80
KA2WLH	"	1,676	32	32
N2BOW	**7**	**68,364**	**212**	**162**
KQ2M	**3.5**	**1,247,906**	**1133**	**433**
K3ZJ	**A**	**2,089,552**	**1420**	**584**
N3BJ	**A**	**1,562,368**	**1160**	**544**
KS3F	**A**	**737,660**	**947**	**479**
W3GM	"	457,002	515	351
N3AOE	"	414,375	599	375
W3ARK	"	168,682	343	251
N3BNA	"	153,120	331	240
WB3BRF	"	130,560	354	256
W3FQE	"	28,980	110	92
KA3AVB	"	18,704	150	112
W3RGX	"	8,413	54	47
NN3SI	"	621	23	23
			(Op. W4KM)	
KC3QS	"	154	13	11
WA3DMH	**14**	**53,067**	**151**	**133**
K3TW	**3.5**	**74,984**	**261**	**182**
W3BGN	1.8	15,132	99	78
AI2C/4	**A**	**1,216,152**	**1034**	**504**
K4JPD	**A**	**1,201,218**	**1214**	**514**
			(Op. WA4OZT)	
NQ4I	**A**	**532,532**	**645**	**418**
KQ1Y/4	"	366,005	791	355
W4WKQ	"	265,220	507	298
N4UH	"	203,000	312	200
WB4QNX	"	148,333	278	211
			(Op. W1IHN)	
WI4R	"	128,439	256	201
W4UYC	"	73,530	213	171
WU4G	"	68,820	163	155
WK4F	"	65,661	167	129
WB4VQO	"	52,403	165	139
W4KMS	"	28,248	146	132
K4OD	"	6,624	50	46
N4EJV	**28**	**8,778**	**70**	**57**
N4MM	**21**	**83,248**	**236**	**176**
N4BP	**21**	**70,742**	**234**	**163**
WI4K	**14**	**889,382**	**912**	**433**
W4WJJ	"	181,224	335	216
KG4W	**1.8**	**74,112**	**478**	**193**
AA4MM	**1.8**	**48,348**	**297**	**153**
N4NX	"	23,980	189	110
K5RX	**A**	**1,410,916**	**1204**	**559**
NT5V	**A**	**488,460**	**907**	**420**
WA5IYX	"	69,600	216	150
K5DEC	"	63,375	144	125
W5PWG	"	11,172	104	84
W5EIJ	"	2,475	48	45
KA5W	**21**	**9,558**	**69**	**54**
WB5VZL	**14**	**1,595,568**	**1539**	**624**
KE5CK	"	339,786	801	387
K4VUD/5	"	173,402	602	277
N5RZ	**3.5**	**428,542**	**829**	**353**
WB5YLT	"	22,946	190	149
K5UR	**1.8**	**122,664**	**538**	**228**
KI6P	**A**	**4,483,792**	**2473**	**568**
			(Op. WA6VEF)	
K6HNZ	**A**	**2,274,965**	**1706**	**385**
K6EID	**A**	**730,622**	**765**	**401**
N6CCL	"	329,940	530	270
K6KLY	"	283,436	412	236
N8BJQ/6	"	249,935	408	237
NC6M	"	214,011	572	301
W6OUL	"	84,320	199	170
WA6TKT	"	72,360	201	134
AK6T	"	65,412	229	158
AJ6V	"	49,010	196	145
K9AGL/6	"	36,800	156	100
WE6G	"	30,624	151	132
K6SG	"	21,090	99	95
KT6V	"	20,976	94	76
K6CSL	"	19,866	114	77
N6JM	"	19,602	92	66
W6DNY	"	15,189	115	83
K6NA	"	10,976	63	56
K6LRN	"	2,912	33	28
K0EJ/6	**14**	**103,000**	**307**	**206**
NM6L	"	12,994	100	89
AA6EE	"	2,967	44	43
NI6W	**7**	**972,890**	**833**	**271**
W6RJ	**3.5**	**163,090**	**392**	**235**
WB6JMS	"	51,680	173	136
KS7T	**A**	**479,560**	**818**	**380**
W7AYY	**A**	**181,118**	**346**	**238**
W7GUR	"	108,402	246	178
W7QN	"	73,628	193	158
W7TSQ	"	68,355	193	147
KS7L	"	44,247	173	129
KX7J	"	43,896	172	124
W7RIR	"	861	21	21
WA7TUX	"	756	30	28
WA7KLK	**21**	**25,542**	**134**	**99**
WA7GVM	**14**	**515,318**	**658**	**382**
WB7FDQ	**14**	**412,729**	**828**	**389**
NI7T	"	277,200	531	275
KC7GX	"	70,964	191	157
WB7CLU	"	59,388	176	147
KT7G	"	46,136	239	146
WA7CGR	"	34,122	134	94
KB7WN	"	2,160	30	27
KA7KDU	**7**	**44,460**	**247**	**130**
K7GWK	**3.5**	**133,952**	**340**	**184**
K7LXC	"	92,340	235	162
K7IDX	**1.8**	**1,872**	**46**	**39**
AI8S	**A**	**1,235,426**	**1069**	**557**
N8CTZ	**A**	**107,501**	**259**	**193**
W8UPH	"	101,455	248	197
WA8YTM	"	97,028	240	191
K8KUH	"	63,705	182	155
NI8Y	"	49,632	196	88
W8VEN	"	31,680	150	120
W8FEM	"	18,984	93	84
WA8NDE	"	12,864	111	96
W8KKF	"	456	25	24
WD8PAQ	**28**	**528**	**22**	**22**
N8II	**14**	**1,272,866**	**1068**	**469**
KB8PK	"	540,912	605	354
NJ8N	**7**	**59,452**	**268**	**167**
KB8IZ	"	11,484	74	66
N8EKS	"	7,650	55	51
KN8R	**3.5**	**247,456**	**680**	**296**
KU8E	**3.5**	**136,500**	**480**	**250**
KD8X	"	104,860	586	245
KC8JH	"	95,850	355	225
W8IMZ	"	23,520	132	120
KJ9D	**A**	**1,300,336**	**1120**	**536**
			(Op. KK9V)	
KM9L	**A**	**1,138,470**	**1109**	**554**
			(Op. WB9JKI)	
KV9S	"	442,308	666	372
KE9Y	"	273,695	455	335
KC9EW	"	171,351	317	241
NA9J	"	49,170	186	165
KB9AW	"	40,800	136	120
W9GMV	"	35,424	149	123
K9BQL	"	9,702	75	66
KA9RSL	"	7,644	100	84
KQ9L	**14**	**977,850**	**981**	**477**
KC9XF	**14**	**382,320**	**540**	**354**
			(Op. N9EJL)	
KR9G	"	117,576	262	213
N9BAF	"	28,435	129	121
AG9S	**7**	**146,286**	**505**	**243**
KB0C/9	"	57,380	215	151
KC9FC	"	7,396	47	43
K9ZO	**3.5**	**299,464**	**744**	**332**
KS9U	**3.5**	**163,016**	**555**	**287**
KR0Y	**A**	**2,458,500**	**1500**	**660**
KK0L	**A**	**433,955**	**867**	**379**
KV0I	**A**	**366,272**	**791**	**388**
KB0U	"	231,054	384	291
KC0XK	"	219,776	411	272
KC0SV	"	180,090	352	261
KJ0G	"	175,536	350	212
W0GOQ	"	174,195	380	245
WB0ISW	"	138,316	331	229
W0IZV	"	129,720	316	230
K0GAS	"	84,494	238	166
W0G0R	"	52,800	133	110
W0KFX	"	6,566	98	67
K0RWL	**14**	**1,003,220**	**935**	**515**
K0SCM	**14**	**530,728**	**764**	**407**
KD0FW	14	36,250	149	145
W0PPF	"	18,054	134	51

KA8IQR	**7**	**67,064**	**219**	**166**
KØBJ	"	2,160	21	20
KØCS	**3.5**	**70,288**	**312**	**191**
N7DF/8	**1.8**	**19,592**	**223**	**124**

ALASKA

WL7AME	**14**	**71,374**	**230**	**127**
KL7AF	**3.5**	**166,108**	**262**	**131**

ANGUILLA

VP2EC	**14**	**5,011,668**	**2895**	**646**

ANTIGUA

W8KKF/ V2A	**A**	**222,285**	**462**	**219**

CANADA

CG3IY	**A**	**4,437,293**	**2192**	**661**
CG5RA	**A**	**3,750,521**	**2293**	**619**
CG3CRG	"	3,009,270	1616	605
				(Op. VE2ZP)
CG3XN	"	2,937,504	1604	592
CG6WQ	**A**	**918,691**	**1045**	**401**
VY1CC	**A**	**752,576**	**827**	**352**
VY1CW	"	644,954	772	334
CG1ANH	**A**	**422,004**	**525**	**278**
CG7BSM	**A**	**402,896**	**516**	**298**
VE3CWE	"	133,056	225	192
VO1AW	**A**	**111,474**	**200**	**198**
CZ3YDX	"	50,661	138	117
VE5BQ	"	17,490	78	66
VE7IN	**14**	**1,355,790**	**1274**	**430**
CG7EIK	"	654,075	816	323
CZ3NBE	**14**	**300,428**	**445**	**236**
VE7FTC	"	96,268	219	164
CG4AKN	**14**	**88,506**	**283**	**149**
VE2FTU	**14**	**30,300**	**113**	**100**
CG7CXN	"	27,648	138	96
VE2EW	"	22,848	100	84
VE3NYT	"	12,740	75	70
VE2HAR	"	420	18	10
CZ3BMV	**7**	**3,397,962**	**1386**	**521**
VF1CV	**7**	**3,384,648**	**1390**	**522**
CZ3XO	**3.5**	**1,329,840**	**926**	**360**
CG3MFA	**1.8**	**319,140**	**522**	**162**
VE3OME	"	162,798	335	129

COSTA RICA

TI4BGA	**21**	**27,249**	**132**	**93**
TE1W	**7**	**2,037,752**	**1127**	**412**
				(Op. TI2KD)

CUBA

CO2HS	**A**	**103,108**	**205**	**149**

DOMINICAN REPUBLIC

HI8A	**A**	**980,658**	**781**	**362**
HI3AMF	"	109,440	255	144

GREENLAND

OX3OA	**14**	**20,832**	**110**	**93**

HAITI

HH2WL	**A**	**973,280**	**1133**	**395**

MARTINIQUE

FM5CD	**7**	**3,163,156**	**1306**	**514**

MONTSERRAT

N2BA/VP2M	**A**	**5,626,512**	**3095**	**656**
VP2MBA	"	2,830,999	1858	523
				(Op. W7FP)

SABA/ST. MAARTEN

P46S	**A**	**304,703**	**650**	**203**
				(Op. K3UOC)

AFRICA

CANARY ISLANDS

EA8AMX	**A**	**148,993**	**284**	**157**
EA8BFU	**21**	**275,315**	**456**	**205**
EA8ANT	**3.5**	**539,184**	**384**	**239**
EA8AFS	**1.8**	**282,048**	**306**	**156**

CAPE VERDE

D44BC	**A**	**2,988,545**	**1453**	**515**

CUETA

EA9IE	**A**	**8,744,508**	**3198**	**708**

GABON

TR1G	**A**	**2,873,938**	**1725**	**547**
				(Op. TR8JLD)

MADEIRA ISLANDS

OH1MA/CT3	**7**	**2,775,020**	**1048**	**445**
OH1RY/CT3	**3.5**	**2,816,754**	**1049**	**453**

MOROCCO

CN8CW	**21**	**75,720**	**222**	**120**

REP. OF GUINEA

DL7AX/3X	**A**	**1,046,448**	**1020**	**343**

SOUTH AFRICA

ZS6CDJ	**28**	**45,962**	**170**	**98**
ZS4WD	**21**	**241,776**	**416**	**207**

TUNISIA

3V8PS	**1.8**	**49,128**	**120**	**69**

ASIA

CYPRUS

C44LP	**14**	**2,467,900**	**1910**	**460**
				(Op. 5B4LP)
PAØGMM/ 5B4	"	411,075	551	261

ISRAEL

4X6DK	**21**	**59,736**	**212**	**131**

JAPAN

JG1ZUY	**A**	**2,383,418**	**1584**	**514**
				(Op. JH7PKU)
JH7LRS	**A**	**2,046,936**	**1455**	**493**
JH1YDT	**A**	**817,034**	**804**	**362**
				(Op. JH4UTP)
JA6BIF	"	402,050	536	275
JE6JVJ	"	233,290	412	205
JA6LDD	"	176,256	312	162
JA4ESR	"	84,750	213	113
JAØUMV	"	78,246	221	138
JA7JH	"	76,791	170	143
JE1ARQ	"	71,424	176	124
JH3DEJ	"	49,288	161	101
JG1GGF	"	47,502	157	117
JA2SAP/1	"	36,540	143	84
JHØEPI	"	14,820	76	57
JA6AKV	"	12,928	79	64
JA1JGP	"	11,956	76	61
JP1SRG	"	10,626	80	69
JA1AAT	"	10,353	73	51
JA4RWN	"	8,096	49	46
JE6GIQ	"	6,970	52	41
JG2THA	"	6,048	57	48
JHØXUP	"	3,502	40	34
JI1YDE	"	2,937	41	33
			(Op. JN1IZK)	
JRØELG	"	2,880	37	32
JE7DOT	"	2,664	38	36
JR4ISK	"	2,400	33	24
JH3CON	"	1,890	26	21
JE1KDM/8	"	1,653	20	17
JA1FO	"	1,173	24	23
JN1ENK/3	"	1,071	21	17
JQ1AJH	"	602	17	14
JA1AAV	"	546	14	13
JR3JRI	"	531	23	9
JE1TTO	"	459	19	17
JH1ADR	"	40	4	4
JH1VTF	**28**	**19,404**	**170**	**77**
JO1CRA	**28**	**13,300**	**109**	**70**
JO1NZT	"	10,615	105	55
JE4QLS	"	5,459	76	53
JA1QZC	"	4,715	64	41
JRØBQT	"	851	29	23
JN1TEN	"	765	20	17
JF6TMH	"	3	1	1
JR1WHW	**21**	**129,778**	**312**	**187**
JR6VRU	**21**	**106,140**	**275**	**174**
JR3ISM	"	70,077	245	141
JP1FZA	"	55,476	193	138
JL1MWI	"	47,291	168	131
JA2BNN	"	46,200	184	120
JP1LGJ	"	40,341	162	113
JA1YAG	"	32,450	148	110
			(Op. JHØSPE)	
JH7WKQ	"	30,702	160	119
JP1PPB	"	29,100	133	100
JF2IGP	"	24,960	125	96
JL1KCO	"	22,176	115	88
JA7ZWD	"	18,375	101	75
JE7SLC	"	18,095	105	77
JI3QPN	"	12,728	96	74
JF7JOV	"	12,350	90	65
JHØNZN	"	9,520	75	56
JHØWGN	"	6,572	64	53
JJ2FJM	"	6,392	55	47
JH8TDZ	"	5,628	53	42
JE4MHL	"	2,492	34	28
JS1HMC	"	2,212	32	28
JP1BPG	"	2,080	31	26
JA5EPE	"	2,052	30	27
JE7SWJ	"	1,540	28	23
JR3CVJ	"	1,491	25	21
JO1MCC	"	1,056	22	16
JP1TVZ	"	784	19	16
JR2YZB	"	612	18	18
JE8AGX	"	576	30	24
JM1WZP	"	330	11	10
JO1DKK	"	105	7	5
JH3YJM	**14**	**2,009,500**	**1423**	**500**
				(Op. JA4UDP)
JA3YKC	**14**	**1,426,896**	**1155**	**432**
				(Op. JE3MAS)
JK1MAZ	"	1,203,408	1043	411
JH1AEP	"	1,033,290	1000	387
JA1JDP	"	592,000	728	320
JAØCGJ	"	120,904	245	179
JR3KQJ	"	72,312	221	131
JJ3QPC	"	40,204	160	92
JA4PA	"	30,432	119	96
JHØAIG	"	27,648	120	96
JA1ASO	"	18,881	89	79
JA2ODS	"	13,380	77	60
JH7AJD	"	3,201	35	33
JE7GRW	"	3,168	40	36
JA1BNW	"	2,184	28	28
JA2BAY	**7**	**487,287**	**444**	**261**
JA7YFB	**7**	**383,040**	**394**	**228**
				(Op. JHØQNT)
JA3YKC	"	122,122	182	143
			(Op. JH4RHF)	
JG1DQI	"	1,008	16	14
JR4SRW	"	440	11	10
JA7YAA	**3.5**	**50,630**	**126**	**83**
				(Op. JJ1MVV)
JHØLFE	"	19,312	83	68

KOREA

HL1QT	**14**	**7,668**	**88**	**54**
HL1ABR	**7**	**72,944**	**337**	**94**

MALAYSIA

9M2DC	**A**	**78,364**	**454**	**137**

MONGOLIA

JT1BG	**A**	**146,671**	**564**	**161**
JT1BQ	**14**	**77,250**	**273**	**150**

OGASAWARA IS.

JD1AMA	**14**	**60,750**	**278**	**135**

U.S.S.R.

ARMENIA

UG6JJ	**14**	**3,008**	**32**	**32**

ASIATIC

UA9MR	**A**	**432,474**	**780**	**294**
UA9SG	**A**	**82,810**	**241**	**130**
UA9FM	"	16,770	98	78
UA9XDG	"	4,732	34	28
UA9CB	"	2,813	32	29
UA9XR	**14**	**269,001**	**417**	**243**
UA9WFJ	"	21,060	100	81
UA9OO	"	160	8	8
UA9XM	"	60	5	4
UA9CI	**7**	**284,530**	**314**	**185**
RA9YD	**3.5**	**56,240**	**149**	**95**
UA9CRR	"	46,816	132	76
RA9AKM	**1.8**	**79,074**	**227**	**69**
RAØFA	**A**	**577,593**	**1086**	**261**
UAØQF	**A**	**571,931**	**1251**	**289**
UWØCM	"	15,400	82	70
UWØCW	"	6,160	41	35
UAØQCA	**14**	**1,958,390**	**1482**	**505**
UAØSLL	"	199,728	360	228
UAØJD	"	429	13	13
UAØSR	**7**	**138,900**	**312**	**150**
UAØLCZ	"	38,700	178	86
UAØZDD	**3.5**	**71,378**	**178**	**89**
UAØFDX	"	8,704	55	32

AZERBAIJAN

UD6DJ	**A**	**183,396**	**352**	**186**
UD6DR	"	6,684	100	34

GEORGIA

UF6VB	**A**	**1,240**	**22**	**20**
UF6VAW	**7**	**69,372**	**140**	**94**
RF6QAI	**1.8**	**15,255**	**60**	**45**

KAZACH

UL7TT	21	588	14	14
UL7LCW	**3.5**	**12,600**	**59**	**45**

KIRGHIZ

UM8MM	**A**	**45,308**	**221**	**96**
UM8MU	**21**	**66,693**	**266**	**141**
UM8MGO	"	3,640	43	40
UM8MO	**14**	**1,526,400**	**1305**	**480**
UM8MFA	"	17,020	129	92
UM8MFY	3.5	448	14	14
UM8MVM	1.8	77	7	7

TADZHIK

UJ8JMM	**7**	**352,722**	**343**	**199**

TURKOMAN

UH8EAA	**3.5**	**453,504**	**462**	**192**

UZBEK

RI8BB	**21**	**58,801**	**235**	**127**
RI8CA	**7**	**131,856**	**196**	**134**

EUROPE

AUSTRIA

OE1PPC	**A**	**540,454**	**672**	**379**
OE9SLH	"	60,060	204	154
OE3NPW	**14**	**639,360**	**767**	**384**

AZORES IS.

CQ8CQ	**A**	**1,951,736**	**1557**	**508**

BALEARIC ISLANDS

EA6EA	**A**	**11,322**	**80**	**74**
EA6VQ	**21**	**223,608**	**445**	**242**
EA6OA	"	91,469	261	179
EA6URP	**14**	**118,548**	**451**	**222**
				(Op. EA6GP)
EA6SK	"	32,696	174	134
EA6NP	"	49	7	7

BELGIUM

ON5GQ	**A**	**471,150**	**602**	**349**
ON4XG	"	69,135	219	165
ON5FV	**21**	**1,716**	**28**	**22**
ON8BK	**14**	**576,084**	**745**	**366**
ON5WL	"	16,198	125	89

BULGARIA

LZ2VP	**A**	**170,040**	**445**	**260**
LZ2KZA	"	129,294	335	198
			(Op. LZ2E52)	
LZ1KKZ	"	118,534	339	194
			(Op. Plamen)	
LZ1BY	"	53,491	185	149
LZ1WY	**14**	**4,794**	**70**	**51**
LZ2KHB	"	690	28	23
			(Op. William)	
LZ1KSN	**3.5**	**265,392**	**441**	**228**
				(Op. Boyko)

CRETE

SV1JG/ SV9	**A**	**1,777,545**	**1989**	**513**
J4ØDC	"	486,081	1103	353

CZECHOSLOVAKIA

OK1RI	**A**	**2,693,670**	**1685**	**606**
OK2BTI	**A**	**800,000**	**928**	**400**
OK2RU	**A**	**721,280**	**824**	**392**
OK1KZ	"	235,944	485	261
OK2BBI	"	102,114	256	186
OK3TEI	"	77,043	249	183
OK2PCL	"	62,550	186	150
OK3CZM	"	52,403	199	139
OK1AXB	"	32,816	149	112
OK2PCF	"	25,957	140	101
OK1DMA	"	25,896	140	104
OK1EP	"	20,090	102	98
OK1MHI	"	9,800	76	70
OK2PGB	"	8,978	75	67
OK3CEG	"	7,488	55	48
OK1AYP	"	4,366	41	37
OK2KVI	"	3,159	45	39
OK1TW	**21**	**16,948**	**96**	**76**
OK2BJR	"	675	15	15
OK3CSC	**14**	**2,857,755**	**1945**	**601**
OK1TN	**14**	**516,084**	**667**	**348**
OK1FV	"	211,452	429	263
OK3CAP	"	49,818	191	138
OK2TBC	"	34,185	155	129
OK1PFJ	"	30,032	145	112
OK3CDZ	"	18,972	132	93
OK2SPJ	"	18,228	106	84
OK2ABU	"	17,424	100	88
OK1KJA	"	17,264	107	83
			(Op. OK121740)	
OK2PDC	"	9,027	97	59
OK1JST	"	7,076	76	61
OK2BQL	"	7,050	52	47
OK2BTC	"	5,547	69	43
OK2SRA	"	4,224	50	44
OK1JCW	**3.5**	**401,684**	**655**	**274**
OK1AJN	**3.5**	**153,846**	**422**	**189**
OK1DWX	"	122,400	354	180
OK2HI	"	100,464	310	161
OK3UG	"	1,734	52	43
OK3CQD	**1.8**	**28,120**	**146**	**95**

DENMARK

OZ3SK	**A**	**411,348**	**523**	**354**
OZ5EV	**A**	**274,120**	**399**	**308**
OZ6PI	"	51,120	187	142
OZ4RT	"	10,971	69	69
OZ4RS	"	10,290	93	70
OZ1HUE	"	1,846	30	26
OZ1DYI	"	600	21	20
OZ1ACB	21	105	7	7
OZ8CT	**14**	**120,196**	**331**	**199**
OZ1BQA	"	69,960	216	165
OZ1ACB	"	14,985	99	81
OZ4NA	**7**	**38,304**	**172**	**114**
OZ1BUR	"	6,726	57	53
OZ4MD	**3.5**	**29,400**	**135**	**105**

ENGLAND

GBØTNB	**A**	**654,833**	**726**	**401**
				(Op. G4TNB)
G4XKR	**A**	**84,600**	**240**	**180**
G3ICG	"	80,181	260	151
GØAEV	"	43,512	184	147
G4OKN	"	30,081	162	60
G6QQ	"	29,696	155	116
G4ULZ	"	27,280	144	110
GØABW	"	4,182	42	41
G4NXL	**21**	**784**	**23**	**16**
G3FXB	**14**	**3,390,363**	**2110**	**597**
GB3RN	"	321,126	541	299
				(Op. G4NXG)
G8VF	"	36,378	169	129
G4XTM	**7**	**93,500**	**254**	**170**

FINLAND

OH3UU	**A**	**263,425**	**394**	**257**
OH7NW	**A**	**75,840**	**264**	**160**
OH8ZX	"	40,434	170	138
OH7KA	"	6,960	69	58
OH3WD	"	12	4	3
OH5RZ	**21**	**4,641**	**48**	**39**
OH6NU	**14**	**1,323,504**	**1378**	**504**
				(Op. OH6MW)
OH2BA	**14**	**1,131,822**	**1300**	**454**
				(Op. OH1VR)
OH6YF	**14**	**1,031,598**	**1018**	**446**
OH2BVE	"	308,574	600	279
OH8LQ	"	149,188	578	247
OH2BYS	"	87,061	241	181
OH5JJ	"	21,582	130	99
OH6CD	"	10,950	105	75
OH1ZAA	"	6,762	62	49
OH5JC	"	1,836	28	27
OH2FQ	"	1,232	22	22
OH2BSS	"	990	40	18
OH1PY	"	884	18	17
OH2TE	"	826	35	15
OH5MX	"	342	19	18
OH1PN	"	3	1	1
OH2JA	**3.5**	**501,696**	**718**	**288**

FRANCE

FE6AOJ	**A**	**361,566**	**518**	**318**
FE8WE	"	272,568	500	277
F6CQU	**14**	**474,308**	**690**	**283**
FE6BVB	**14**	**73,248**	**259**	**168**
FE9DK	"	58,220	231	164
FD1JOT	"	24,309	152	111
FD6KJO	"	11,840	82	74
FD1JVI	"	10,395	126	77
F9KP	**3.5**	**27,260**	**132**	**94**

GERMANY (FRG)

DL6FBL	**A**	**2,481,050**	**1701**	**550**
DA2ER	**A**	**702,984**	**797**	**408**
DJ7IK	"	251,687	546	293
DF5WO	"	181,890	439	235
DL3EBX	"	176,336	413	206
DL4LAX	"	73,272	239	172
DL8AAE	"	69,046	222	158
DL7AEJ	"	38,875	163	125
DF2KD	"	33,915	183	119
DF2RG	"	33,201	135	119
DL8DAX	"	15,355	120	83
DL1AM/a	"	7,296	65	64
DF6IT	"	518	14	14
DL3ME	**21**	**2,376**	**33**	**27**
DL8PC	**14**	**1,351,770**	**1174**	**471**
DJ4PT	**7**	**1,494,768**	**1048**	**456**
DL8MBS	"	286,896	447	258
DL3WB	"	10,956	80	66
DF8XC	**3.5**	**483,600**	**824**	**318**
DF1LX	"	183,084	400	209
DH8AAC	"	720	21	20

GERMANY (GDR)

Y23EK	**A**	**2,528,253**	**1681**	**567**
Y24LE	**A**	**307,380**	**549**	**282**
Y36UE	**A**	**273,000**	**511**	**273**
Y33UJ	"	256,360	490	260
Y38YK	"	250,113	499	263
Y25FF/a	"	247,968	511	264
Y45RN	"	222,562	445	257
Y42QO	"	219,992	472	257
Y53XF	"	203,775	426	247
Y75XH	"	178,904	438	214
Y49XN	"	168,328	435	212
Y48ML	"	149,644	372	209
Y44XD	"	139,332	429	204
Y32DN	"	94,760	285	184
Y49RF	"	92,364	251	179
Y24SK/a	"	75,192	236	156
Y36RI	"	50,920	211	134
Y31PA	"	41,987	179	122
Y21HB	"	40,872	201	131
Y44TN	"	34,568	141	116
Y46ZC	"	32,944	158	116
Y39SH	"	22,466	131	94
Y47SF	"	18,693	128	93
Y22VI	"	17,572	119	92
Y34YC	"	16,315	73	65
Y48ZA	"	15,456	111	84
Y53ID	"	15,045	100	85
Y36SG	"	14,981	84	71
Y62QN	"	14,514	111	82
Y32VJ	"	14,200	84	71
Y32PI	"	10,792	92	71
Y25FH	"	9,581	81	67

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Y59ZF	"	1,275	27	25
Y73XH	"	1,025	25	25
Y67YL	"	630	18	18
Y26XM	"	624	16	16
Y51XH	"	560	20	20
Y73WH	"	390	14	13
Y26DO	28	40	8	8
Y36UG	21	585	16	13
Y240H	**14**	**338,433**	**500**	**291**
Y43XE	**14**	**103,045**	**390**	**185**
Y23DG	"	72,209	210	163
Y22RK	"	46,230	214	134
Y24NG	"	44,555	167	133
Y43VF	"	38,875	182	125
Y22XF/a	"	33,040	144	112
Y63TI	"	8,673	99	59
Y32KE	"	4,620	50	44
Y32HE	"	3,471	40	39
Y46XF	"	2,905	38	35
Y27DL	"	2,304	40	36
Y34XF	"	1,512	30	27
Y36SI	"	1,290	31	30
Y34XN	"	1,080	22	20
Y31MB	"	1,032	25	24
Y22BC	"	864	18	18
Y26NM/a	"	777	25	21
Y24LN/a	"	570	20	19
Y26VG/a	"	459	21	17
Y22LO	"	360	12	12
Y53ZL	"	276	15	12
Y24KZ/a	"	273	15	13
Y28XL/a	"	208	14	13
Y56ZA	"	132	12	11
Y31NJ	"	66	7	6
Y31VE	"	40	6	5
Y58SA	"	12	3	3
Y51XO	**7**	**19,320**	**100**	**84**
Y24YH	"	5,580	60	45
Y51TG	"	2,304	36	32
Y25JA/a	"	1,196	25	23
Y26MH/a	"	880	20	20
Y61ZF	"	450	15	15
Y31YE/p	"	32	4	4
Y27FN	**3.5**	**400,960**	**771**	**280**
Y51YC	**3.5**	**183,872**	**459**	**221**
Y22JJ	"	170,100	401	210
Y47ON	"	143,200	388	200
Y26UH	"	17,664	99	92
Y23XF	"	6,678	67	53
Y23LD	"	882	23	21

GIBRALTAR

OH2KI/ZB2	**7**	**1,954,210**	**1050**	**365**

GREECE

J41PL	**A**	**291,560**	**712**	**296**
SV1RP	**21**	**10,787**	**78**	**67**

HUNGARY

HA8MM	**A**	**1,458,366**	**1262**	**546**
HA8XX	"	161,445	422	235
HA5KDB	"	40,576	136	128
			(Op. Csaba)	
HA4XG	"	3,848	44	37
HG9MAP	**28**	**4,080**	**63**	**48**
HG5AAS	"	731	24	17
HA1UI	21	850	18	17
HA8VB	**14**	**81,459**	**365**	**189**
HA7RO	"	6,380	69	58
HA8IE	**3.5**	**639,744**	**870**	**336**
HA1XR	**3.5**	**351,576**	**674**	**257**
HA5ABC/p	"	150,592	467	208
HA4KXR	"	78,396	330	141
			(Op. HA8LKK)	
HA6KNI	"	63,732	238	141
			(Op. Jozsef)	
HA8BY	"	55,476	209	138

IRELAND

EI4DW	**A**	**190,820**	**330**	**203**

ITALY

I6FLD	**A**	**2,318,234**	**1730**	**557**
IV3GOW	**28**	**9,360**	**86**	**52**
I5MXX	**14**	**1,901,511**	**1571**	**531**
I5FCK	**14**	**1,189,480**	**1181**	**454**
IV3WMP	**7**	**137,670**	**340**	**195**
I4EWH	**3.5**	**328,192**	**570**	**256**
IK5BCU	"	52,578	209	127

MONACO

3A5F	**A**	**79,800**	**326**	**168**

THE NETHERLANDS

PAØZH	**A**	**995,963**	**1053**	**419**
PA2SWL	**A**	**142,747**	**364**	**209**
PAØKDM	"	**91,016**	**300**	**104**
PAØLIE	"	**51,852**	**348**	**149**
PA3DWD	"	4,816	54	43
PA3COA	"	3,600	54	48
PA3DQQ	"	2,494	50	43
PI5PVI	"	882	21	21
PAØRWS	"	180	10	10
PA3CEF	**14**	**641,358**	**795**	**333**
PAØQX	"	141,642	346	183
PA3DLC	"	35	5	5

NORWAY

LA2AD	**A**	**38,936**	**202**	**124**
LA2CBA	**A**	**17,600**	**117**	**100**
LA3JAA	"	13,124	78	68
LA1R	"	12,024	101	72
			(Op. LA2YT)	
LA8DY	"	9,900	76	66
LA6MY	"	6,912	77	72
LA5TBA	"	133	7	7
LA1RN	21	96	6	6
LA7JO	**14**	**1,355,718**	**1266**	**546**
LA3PU	**14**	**163,372**	**356**	**188**
LA6WEA	"	140,346	431	226
LA2IE	"	74,620	174	164
LA1B	"	50,552	206	142
			(Op. LA1QDA)	
LA6BBA	"	45,072	240	144
LA1OEA	"	912	20	19
LA1PBA	"	45	5	5
LA1NG	**7**	**76,956**	**215**	**159**
LA2IZ	"	13,916	87	71
LA5JX	"	980	24	20
LA2YT	**3.5**	**3,256**	**44**	**37**

POLAND

SP6DVP	**A**	**125,079**	**306**	**173**
SP6CZ	**A**	**120,637**	**136**	**121**
SP9BLF	"	114,660	291	210
SP7HKK	"	39,780	126	78
SP3ZAU	"	14,442	104	87
			(Op. SP3IOE)	
SP9MQH	"	11,760	63	60
SP9HZF	"	4,346	46	41
SP3IOE	"	2,520	43	30
SP3LWU	"	1,848	26	24
SP5ALP	"	555	17	15
SP5ENA	"	252	8	7
SP6BFK	**21**	**3,366**	**35**	**34**
SP6ECF	"	65	5	5
SP9NLS	"	60	6	5
SP6CIK	**14**	**90,896**	**273**	**184**
SP8NR	**14**	**83,868**	**230**	**174**
SP2EXN	"	79,032	222	178
SP1CHV	"	47,160	184	130
SP9PT	"	23,776	101	94
SP7EQN	"	17,428	110	84
SP9MRO	"	17,085	101	85
SP6JOE	"	16,188	117	71
SP2DKI	"	15,246	105	77
SP4GFG	"	10,792	80	71
SP9CTW	"	8,494	65	62
SP8ZBW	"	4,841	55	47
			(Op. SP8GEY)	
SP3JHY	"	2,700	32	30
SP7DZA	"	240	10	10
SP8GEY	"	112	8	8
SP9PRO	**7**	**179,292**	**387**	**201**
			(Op. SP9LJD)	
SP9LDI	"	10,290	107	49
SP9CUU/9	"	3,600	46	40
SP9LJE	**3.5**	**248,640**	**560**	**240**
SP6CDK	**3.5**	**179,280**	**417**	**216**
SP5ALP	"	130,152	385	174
SP5PEN	"	81,740	302	134
SP9GDB	"	52,272	217	132
SP3GXH	"	45,360	201	120
SP6JIR	"	17,784	121	78
SP8TQ	"	14,454	103	73
SP4CUF	"	12,384	94	72
SP9IWO	"	3,192	45	38
SP1CGP	"	3,096	43	36
SP4LXE	"	684	21	19
SP5INQ	**1.8**	**60,114**	**214**	**129**

PORTUGAL

CT1BCM	**A**	**3,262,808**	**2010**	**604**
			(Op. OH2BAZ)	
CT1APN	**A**	**155,914**	**340**	**209**
CS5TM	"	80,080	227	154
CU6BY	"	29,853	137	107
CT1CHU	"	17,360	121	80
CT1AHU	"	5,198	52	46
CT1AV	**21**	**1,008**	**22**	**21**
CT1CVF	"	336	12	12
CQ6CQK	**14**	**5,440**	**76**	**68**
CT4KQ	**7**	**1,089,564**	**695**	**357**

ROMANIA

YO5AVN	**A**	**184,208**	**396**	**232**
YO7APA	**A**	**140,304**	**333**	**222**
YO5BRZ	"	100,368	263	153
YO3AIS	"	46,494	176	123
YO6AJI	"	41,382	171	114
YO5BYA	"	28,800	164	90
YO5AAT	"	26,269	124	109
YO9DIA	"	24,472	134	92
YO6DMV	"	19,314	112	87
YO2CMI	"	2,652	41	39
YO9DHY	"	1,922	36	31
YO5KAP	"	924	29	22
			(Op. YO5AAA)	
YO5AUV	"	238	16	14
YO3BTC/7	**14**	**7,540**	**73**	**58**
YO3XL	"	4,992	66	52
YO4BXX	"	4,800	122	96
YO2AXG	"	2,014	51	38
YO5BLA	"	546	25	14
YO6ADM	"	108	6	6
YO3LX	"	77	7	7
YO9CUF	**7**	**74,296**	**215**	**148**
YO6KNX	"	21,000	122	84
			(Op. Ines)	
YO5CYH	**3.5**	**72,358**	**252**	**143**
YO5CYG	**3.5**	**45,310**	**194**	**115**
YO2DFA	"	44,070	200	113
YO6CVA	"	28,324	146	97
YO7CGS	"	4,812	50	41
YO5BQQ	"	612	18	12

SARDINIA

ISØLLJ	**A**	**16,284**	**114**	**92**

SICILY

IT9YSW	**14**	**53,342**	**290**	**149**

SCOTLAND

GM3KLA	**A**	**181,056**	**422**	**246**
GM4WEW	"	130,143	326	213

SPAIN

EA3CCN	**A**	**1,599,000**	**1350**	**500**
EA1CVY	**A**	**279,994**	**521**	**286**
EA1AWW	**A**	**260,120**	**427**	**280**
EA5JC	"	106,834	266	182
EA3ELM	"	80,883	208	171
EA3DXD	"	76,260	249	164
EA3NU	"	72,600	223	150
EA5FCO	"	72,495	248	179
EA5AEN	"	64,962	195	162
EA5BMF	"	52,934	178	133
EC3BZI	"	32,900	122	94
EA7EHE	"	31,369	150	127
EA1DOD	"	22,927	114	101
EA5CGU	"	15,168	87	79
EA3DZZ	"	12,432	99	84
EA1BFZ	"	2,210	37	34
EA1BZI	"	988	20	19
EA5DCL	"	260	10	10
EA3ELZ	**28**	**1,428**	**28**	**21**
EA7CWA	**21**	**16,750**	**146**	**67**
EA5DIT	"	4,107	39	37
EA2CR	"	2,100	30	28
EA3BWX	"	133	7	7
ED4BVE	**14**	**400,722**	**614**	**329**
EA3CZM	**14**	**75,768**	**232**	**168**
EA7ECT	"	59,295	245	177
EA3FJM	"	58,140	222	170
ED1CI	"	54,322	251	173
EA1BCK	"	44,020	199	142
EA3EYO	"	13,446	91	83
EA5FAG	"	8,208	95	76
EA5DVL	7	364	14	14
EA5DWQ	**3.5**	**1,060**	**26**	**20**
EA5TX	**1.8**	**3,267**	**37**	**27**

SVALBARD

JWØEQ	**14**	**42,642**	**278**	**138**
			(Op. SP5EXA)	
JW5VAA	"	13,261	108	89

SWEDEN

SMØKNV	**A**	**22,310**	**115**	**97**
SM6MSG	"	2,370	31	30
SM5UF	"	435	15	15
SMØAJU	**14**	**1,515,366**	**1244**	**522**
SM2LWU	**14**	**219,240**	**461**	**270**
SM6LIF	"	126,445	281	209
SM7DXQ	"	46,464	166	132
SMØBDS	"	44,160	160	138
SM7TV	"	23,230	141	101
SMØTW	"	16,605	93	81
SM6HQK	"	8,192	79	64
SM7GIL	"	7,155	65	53
SM7LPY	"	4,992	44	39
SM4CMG	"	4,680	47	45
SM5LPC	"	341	11	11
SM6BJI	**3.5**	**128,832**	**351**	**176**
SM6BGG	"	94,200	279	157

SWITZERLAND

HB9AAA	**A**	**427,572**	**500**	**333**
HB9AON/p	"	165,432	410	226
HB9BVV	**14**	**78,064**	**289**	**164**

WALES

GW4BLE	**14**	**2,697,634**	**1996**	**523**

YUGOSLAVIA

YT3M	**A**	**3,546,244**	**1856**	**611**
			(Op. YU3ZO)	
YU7MDZ	**A**	**1,400,870**	**1358**	**505**
YU7AV	**A**	**1,232,395**	**1195**	**515**

Say You Saw It In CQ

YU7SF	"	65,075	185	137
YU2CQ	"	38,054	132	106
YU1PQI	"	1,782	28	27
YU3MA	**28**	**2,400**	**38**	**30**
YU2LLL	"	24	4	4
YU2KDE	**21**	**104,236**	**301**	**206**
			(Op. YU2LNI)	
YU3SB	"	29,100	129	100
YZ1K	**14**	**326,796**	**762**	**339**
			(Op. YU1RS-1083)	
YU7MGU	"	5,040	77	56
YU3EY	**7**	**1,539,456**	**891**	**456**
4N3E	**7**	**1,163,520**	**964**	**404**
			(Op. YU3HAM)	
YU7AD	"	41,328	106	82
YU1FJK	**3.5**	**323,334**	**505**	**253**
			(Op. YU1QGL)	
YU3MM	**1.8**	**75,060**	**257**	**135**

U.S.S.R.
EUROPEAN

UW3HV	**A**	**1,421,312**	**1353**	**512**
UA1ZO	**A**	**494,385**	**711**	**345**
RA1AA	**A**	**430,116**	**708**	**292**
RW3DW	"	420,701	668	331
UA3DRB	"	242,874	351	309
UW6LC	"	193,214	402	259
UA4CDL	"	146,023	370	233
UA3TN	"	118,296	283	212
UA6ED	"	42,470	226	137
UA6XT	"	25,288	140	109
UA4CO	"	17,085	100	85
RA4AH	"	14,525	103	83
OK3IA/UA3	"	11,613	87	79
UA6ABG	"	7,280	84	65
RA1NA	"	6,943	69	53
RA4PM	"	6,336	58	48
UA6PT	"	5,565	65	53
UA4AO	"	2,574	27	26
RA4HA	**21**	**423,536**	**742**	**206**
UA6LS	"	38,951	166	97
UV6LC	**14**	**555,764**	**1028**	**374**
RZ3DR	**14**	**435,102**	**758**	**381**
UV3TE	"	151,512	338	236
RW6PC	"	140,217	395	231
UW1AE	"	107,100	268	225
UA4WCE	"	89,440	290	208
UV3DN	"	84,224	339	188
UV1AT	"	56,981	228	157
UA3TG	"	38,624	172	136
UA4WF	"	34,188	163	116
UV3CS	"	26,216	158	113
UV3MM	"	24,255	105	95
RA3VA	"	23,005	129	107
UA3VCC	"	3,588	40	39
UA3GGQ	"	252	13	12
RV6AA	**7**	**24,464**	**120**	**88**
RV6AB	"	17,020	94	74
RA6LU	**3.5**	**128,740**	**354**	**157**
RA6LBR	"	102,750	239	137
UA3ZDN	"	6,784	59	53

BYELORUSSIA

UC2OR	**A**	**1,093,260**	**1189**	**420**
UC2LK	"	3,393	45	39
UC2AAD	**14**	**52,560**	**200**	**144**
UC2OM	"	12,640	90	80
RC2CC	"	11,050	87	65
UC2BA	"	6,084	64	52
UC2OAR	**3.5**	**33,630**	**141**	**95**

ESTONIA

RR2RR	**A**	**548,262**	**725**	**426**
RR2RX	"	5,106	37	32
UR2RCU	"	1,586	26	26
RR2RN	**14**	**872,874**	**1155**	**426**
UR2OI	"	153,888	361	229
UR2RER	"	384	12	12
UR2RAM	**3.5**	**28,272**	**221**	**124**
UR2RNG	"	27,636	140	94

FRANZ JOSEF LAND

UA1OT	**14**	**7,254**	**67**	**62**

KARELIA

UN1CC/R	**A**	**74,484**	**104**	**71**

LATVIA

UQ2GN	**A**	**376,970**	**585**	**298**
UQ2GLW	"	125,252	277	181
UQ2GM	**7**	**842,016**	**915**	**336**

LITHUANIA

UP3BH	**A**	**492,688**	**697**	**329**
UP2BR	**A**	**104,310**	**252**	**190**
UP2PBM	"	77,800	209	140
UP2AV	"	35,844	187	116
UP2BBF	"	22,692	125	93
UP2BKZ	"	22,320	122	93
UP2PAQ	"	17,480	97	76
UP2OU	**21**	**21,995**	**114**	**83**
UP2NK	**14**	**1,710,248**	**1354**	**568**
UP2XX	**14**	**204,752**	**434**	**268**
UP2BJM	"	134,640	337	220
UP2WN	"	36,487	150	107
UP2PAE	"	23,229	136	87
UP2ND	"	13,090	101	77
UP2PCK	"	2,886	46	39
UP3BA	**7**	**267,344**	**433**	**248**
UP2BLF	"	216,202	476	223
UP2BM	**3.5**	**318,000**	**716**	**212**
UP2OQ	"	384	14	12
UP2BZ	"	8	4	4
RP2BID	**1.8**	**5,440**	**73**	**40**
UP2BNT	"	1,056	24	22

MOLDAVIA

UO5GR	**3.5**	**20,992**	**114**	**82**
UO5OV	"	19,840	112	80

UKRAINE

RT4UA	**A**	**720,384**	**851**	**384**
RB5EG	**A**	**293,314**	**539**	**287**
UB5EKE	"	189,513	468	221
UY5TE	"	154,706	374	206
RB5AL	"	126,355	399	185
UB5HEX	"	45,936	153	132
RB5MP	"	23,312	111	94
RB5QZ	"	10,011	80	71
RB5OR	"	2,788	41	34
RB5CCO	28	8	2	2
RB5IM	**21**	**446,790**	**668**	**281**
RB5IZ	**14**	**1,266,705**	**1382**	**495**
UT5GM	"	413,105	608	319
UB5IBV	**7**	**8,835**	**116**	**57**
UB5CCP	**3.5**	**53,336**	**217**	**113**
UB5BBZ	"	46,368	185	112
UB5EEP	"	21,384	114	81
UB5WE	**1.8**	**69,552**	**321**	**108**
UB5IUA	"	20,592	92	66

OCEANIA

AMERICAN SAMOA

AH8A	**A**	**4,284,536**	**2716**	**556**

AUSTRALIA

VK2WU	**A**	**338,865**	**573**	**205**
VK2DVU	"	317,339	593	187
VI3AUQ	**A**	**79,502**	**221**	**127**
VK3DNC	"	41,085	130	99
VK1RJ	**A**	**6,750**	**52**	**45**
VK1LF	"	2,883	39	31
VK8XX	**28**	**476,710**	**1269**	**130**
VK4KWO	**21**	**141,372**	**497**	**99**
VK2PWS	**21**	**32,768**	**176**	**64**
VI3CJW	**14**	**492,060**	**654**	**278**
VK2APK	**14**	**197,877**	**340**	**213**
VK3SM	"	15,244	79	74

HAWAII

AI6V/NH6	**A**	**6,677,500**	**3227**	**500**
AH6FL	"	643,968	678	234
NH6AB	**14**	**357,304**	**538**	**236**

INDONESIA

YB4FW	**A**	**488,160**	**937**	**270**
YC0DNK	**21**	**2,079,090**	**1825**	**390**
YC0DPO	**21**	**2,012,400**	**1883**	**360**
YC0EMJ	"	678,400	1213	212
YB0ZDC	"	126,076	250	172

NEW ZEALAND

ZL1IM	**A**	**55,468**	**201**	**98**
ZL1JE	**28**	**2,280**	**36**	**24**
ZL1ANJ	**21**	**1,753,825**	**1651**	**365**
ZL1AXB	**14**	**1,927,842**	**1446**	**466**
ZL1BMU	**3.5**	**297,600**	**335**	**186**

PHILIPPINES

K1BAZ/DV1	**A**	**136,148**	**472**	**101**
DV1TV	**21**	**38,640**	**194**	**70**

SOUTH AMERICA

ARGENTINA

LU1BR	**A**	**2,329,500**	**1268**	**500**
LU1E	**28**	**907,128**	**946**	**344**
			(Op. LU3AJW)	
LU1VK	"	51,520	168	112
LU2FDR	**21**	**5,364,483**	**2697**	**673**
LU4LAV	**21**	**2,654,106**	**1638**	**546**
LU1MBB	"	189,314	317	206
LU8ESU	**14**	**468,056**	**499**	**328**
LU1MFK	"	9,860	68	58

BRAZIL

PP2ZDD	**A**	**2,796,429**	**1734**	**541**
PT7AUI	"	57,810	159	123
PY1OL	"	2,856	36	28
ZY5BI	**21**	**1,481,935**	**1161**	**455**
PY2OO	"	66,000	205	132
PY4OO	**14**	**1,237,740**	**997**	**420**
PT2TF	"	44,343	130	117
ZV9ZE	**7**	**22,750**	**70**	**65**
PS8DX	"	2,280	20	20

CHILE

CE3DNP	**A**	**2,472,448**	**1548**	**512**
CE4BQO	**A**	**209,994**	**392**	**186**
CE3BYL	"	176,904	363	234
CE4ETZ	"	98,420	231	145
CE6EZ	**21**	**3,576,551**	**2014**	**601**
CE6ECC	**7**	**10,152**	**51**	**47**
CE3FIP	**3.5**	**103,500**	**172**	**115**

COLOMBIA

HK3LT	**A**	**237,944**	**384**	**196**
HK3GZB	**21**	**69,828**	**298**	**92**
HK1HHX	**7**	**187,560**	**349**	**90**

PARAGUAY

ZP5LOB	**A**	**744,444**	**707**	**366**
ZP5JAL	"	11,770	74	55
ZP5HEB	**14**	**222,300**	**351**	**225**
ZP5JCY	**7**	**1,480,752**	**712**	**364**

PERU

OA4BHZ	**21**	**301,886**	**478**	**221**

URUGUAY

CX1TH	**21**	**963,424**	**939**	**352**
CX8CG	"	45,425	146	115

VENEZUELA

YV6BTF	**28**	**198,990**	**483**	**165**
YV6CAX	**3.5**	**610,844**	**469**	**221**

MULTI-OPERATOR SINGLE TRANSMITTER

UNITED STATES

KN6M/5	**4,390,841**	**2760**	**793**
N4WW	**3,703,072**	**1970**	**776**
KW8N	**3,646,552**	**2195**	**728**
NO4J	3,182,366	2122	737
N7TT	**2,945,792**	**1887**	**622**
NE8T	2,902,345	1944	685
NS6X	**2,767,674**	**1815**	**546**
KI1G	**2,418,715**	**1731**	**635**
NB6L	2,407,986	1608	522
AA5B	1,761,984	1759	608
NR5K	1,697,460	1428	570
NU6S	1,461,096	1273	504
KMØL	**1,121,838**	**1278**	**543**
WC6I	1,090,800	1009	400
NI2T	**1,019,316**	**1122**	**519**
KS9O	**946,433**	**996**	**461**
WB6ZHT	871,689	950	403
NN5E	665,112	1049	444
KX1A	656,040	766	420
AAØA	601,480	829	440
NJ8G	542,880	613	360
KNØL	284,517	457	313
WD8QDQ	260,520	366	260
NV4G	230,823	441	309
NJ8L	212,544	386	246
KG6MO	203,633	472	269
KN7N	188,256	551	296
KD5RW	112,288	356	232
KC7RN	65,703	268	181
WØCET	50,008	256	188
W3KWH	**47,790**	**184**	**135**
WD6DJY	34,226	165	109
W1BK	14,941	83	67

NORTH AMERICA

NP4CC	**7,771,713**	**3589**	**753**
CG4ALO	**3,108,191**	**2071**	**551**
CG7UBC	**1,097,628**	**1014**	**358**

AFRICA

ED8RCT	**5,382,780**	**2293**	**618**

ASIA

JE2YRD	**2,613,750**	**1753**	**510**
5B4ES	**1,308,567**	**1102**	**377**
JA6YAI	1,207,050	1081	390
JA2YKA	1,173,788	1028	407
JA7YRR	323,155	457	245

EUROPE

IO5NPH	**9,504,126**	**3664**	**853**
LZ2KTS	**9,489,510**	**3608**	**873**
OH8AA	**6,460,344**	**3435**	**792**
HG5A	**5,953,426**	**3236**	**733**
HG9R	5,430,470	3043	730
GB2PX	**4,967,865**	**2485**	**735**
HG6N	4,956,000	2759	708
GBØWAS	4,511,430	2677	651
OH5NQ	4,128,894	2437	662
Y44ZI	**4,097,577**	**2689**	**681**
ED7BB	**3,950,793**	**2367**	**693**

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HB9CXZ	**3,512,581**	**2023**	**617**
F6KAW	**3,492,760**	**2326**	**580**
OK6DX	**3,275,686**	**2047**	**746**
OK7MM	3,059,694	1992	606
YZ4Z	**2,947,224**	**2237**	**636**
4N7A	2,887,620	2253	646
YU2CRT	2,878,084	1838	596
GBØWPX	2,811,375	2143	595
EI7H	**2,759,593**	**2004**	**599**
YT3T	2,605,824	1869	576
HG6V	2,394,640	1906	592
SK6TW	**2,215,292**	**1931**	**521**
DLØWPX	**2,095,038**	**1573**	**594**
ED6MDX	**1,870,064**	**1733**	**566**
IO9WPO	**1,750,060**	**1755**	**530**
4U1ITU	**1,738,422**	**1635**	**511**
IO3EJ	1,664,790	1343	526
G6CW	1,625,210	1488	491
HA7KLG	1,493,912	1291	518
HA1KRR	1,399,622	1338	514
Y54ZA	1,334,316	1340	502
Y32ZC	1,227,122	1184	433
ED3CBE	1,155,771	1161	477
DLØJU	1,094,620	933	458
SP5PBE	**1,080,027**	**1042**	**459**
LA4O	**956,088**	**1106**	**441**
OH2BAH	858,552	999	431
DLØUE	786,915	837	435
DLØSB	785,422	979	418
IO6DKP	771,693	984	421
ED1AGN	745,607	899	409
SP9PEZ	539,968	719	352
HAØKHK	482,976	751	344
HA6KNX	445,480	658	344
HA4KYH	429,535	714	317
YO8KOD	**394,415**	**659**	**295**
SP1KYB	390,676	765	286
OK1BB	336,160	496	352
SK3AH	316,642	542	278
CT1BZN	**257,230**	**540**	**290**
ED1WPX	237,552	527	294
GMØAEE/P	**222,807**	**397**	**197**
PI1GOE	**207,872**	**437**	**256**
G3UOA	206,780	426	245
OH7AI	179,816	405	247
OK1KIM/P	179,409	407	237
LA2AB	160,611	554	157
PI4TTC	151,916	332	233
SP6ZFU	148,428	300	217
SP1PBW	119,306	300	187
SP9KOU	71,878	230	159
SP9ZAS	68,838	223	154
OK3KNS	63,140	250	154
YU1AST	47,481	198	147
OK1KZD/P	44,125	205	125
Y66ZF	41,310	197	135
OK1KQJ	39,151	135	119
YO7KFE	18,423	111	89
OK3RDM	16,340	90	86
HA7KMP	14,080	109	88
OK2PBG	8,978	75	67
OK1KCP	7,796	67	42
YO4KAY	7,752	59	51
OK1KUZ/P	7,560	135	56
SP6KCN	2,754	41	34
PI4AMF/A	1,083	20	19
HA3KGJ	714	21	21
OK2KPS	440	23	10

OCEANIA

KD7P/NH4	**10,484,712**	**4765**	**568**
AH2U	**7,576,045**	**4290**	**545**
VK9XB	**6,539,040**	**4183**	**480**
KB6DAW/KH2	2,550,175	2084	415
WH6W	**2,368,461**	**1968**	**327**
DX1IYY	**1,003,074**	**2377**	**141**
YB5AQD	**909,122**	**1211**	**251**
ZL2AH	**313,020**	**595**	**180**
VK6EU/P	**119,305**	**393**	**107**

U.S.S.R. CLUB STATIONS

ASIA

RL8PYL	**6,049,350**	**3489**	**675**
EO9ACS	**3,327,344**	**2200**	**568**
EO8AAK	**3,182,553**	**2152**	**549**
UZØCWA	3,132,120	2412	516
UL8AWE	1,640,520	1439	392
EU7L	1,601,550	1727	450
EO9AUN	1,206,016	1186	448
EV9AW	1,151,425	1007	395
EO8M	**797,181**	**962**	**357**
UI9BWF	**797,120**	**800**	**320**
EU9H	**786,088**	**1075**	**388**
UZ9SWR	620,207	676	287
UF7FWL	**543,474**	**637**	**327**
UZ9WXH	282,492	708	274
UZ9AWH	281,333	422	221
UZ9UZA	269,067	548	364
UZ9OWD	232,959	432	201
UZ9CXU	98,783	318	173
UZ9OXI	41,004	253	153
UM9MWO	3,003	92	33
UZ9AXT	2,208	32	24

EUROPE

UP1BZZ	**5,855,072**	**2875**	**752**
EU3A	**4,288,768**	**2726**	**704**
ER3A	4,155,252	2868	708
EM5T	**3,943,108**	**2556**	**676**
UB4CWW	3,900,792	2641	642
UZ6LWZ	3,373,744	2335	638
EU2P	3,202,425	2213	645
EO5BIM	2,802,240	2211	630
EM4BMG	2,368,710	2200	558
UP1BZR	2,195,111	1662	547
UP1BZG	1,944,165	1397	555
EW2C	**1,878,786**	**1744**	**596**
EU1Q	**1,705,000**	**1588**	**500**
UZ4HWS	1,258,060	1345	476
EO1AZM	1,108,132	1307	449
EO2QGL	1,101,352	903	554
EO5BED	978,350	1243	425
EU1R	**740,000**	**938**	**400**
EO2R	590,784	848	362
EW1AA	588,000	930	350
UZ3DXW	498,336	814	348
UT4UWK	492,670	712	346
UB4OWW	475,850	795	310
UZ6LZZ	468,696	925	331
EO3AQW	457,300	1101	340
EO5O	**435,326**	**790**	**307**
UP1BWV	434,500	733	316
EO3AWK	371,700	640	295
EMØCWN	363,537	704	279
UZ3TXL	358,527	757	317
UQ1GXJ	263,871	517	261
UT4UWE	215,866	465	238
UB4IWB	187,248	601	282
EO5BQM	180,736	455	256
UQ1GWB	179,256	346	231
EW3A	173,628	597	234
RB4IWK	169,225	307	175
UC1WWY	133,136	304	212
UZ3AXH	112,270	257	218
UT4UWG	111,925	333	185
EO3ATD	87,984	352	188
UZ4HWZ	79,152	352	194
EM8CCM	72,294	226	177
UB4AXA	65,656	353	116
UQ1GWX	63,492	211	156
EMØCOR	60,444	203	138
UZ3XWH	41,888	178	119
UZ3SWW	39,271	220	173
UZ3DZQ	33,794	183	122
EM1AA	20,832	130	84
EO1AOS	6,900	83	69
UB4WYA	6,000	62	50
UZ6XWC	3,212	55	44
UT4UWT	2,774	42	38

MULTI-OPERATOR MULTI-TRANSMITTER WORLDWIDE

KH6XX	**24,898,239**	**7553**	**837**
ZZ5EG	**19,121,792**	**5786**	**992**
WL7E	**11,639,033**	**4519**	**799**
IO3MAU	**11,216,183**	**4606**	**869**
KL7IRT	8,446,100	3615	730
GB4ANT	**6,848,424**	**3460**	**792**
JA9YBA	**6,819,066**	**3005**	**729**
CTØBI	**5,286,120**	**3297**	**696**
NF5I	**4,698,360**	**3043**	**842**
NM5L	**4,568,232**	**3092**	**786**
VE7ZZZ	**4,149,428**	**2423**	**556**
JA7YFJ	3,977,820	2292	615
L2X	**3,700,236**	**1983**	**606**
I2MQP	2,703,578	1822	607
UL8LWZ	**2,526,552**	**1874**	**504**
PI4DEC	**2,016,876**	**1855**	**524**
EV4AW	**1,685,970**	**1788**	**495**
UZØLWO	**1,484,190**	**1426**	**414**
OK3KII	**1,404,840**	**1233**	**509**
NO5Q	1,203,488	2036	572
VK75A	**881,790**	**874**	**285**
KJ6V	**376,200**	**554**	**342**
K5NA/2	**301,570**	**400**	**265**
K6XO	211,200	429	264
JAØZAV	207,888	361	213
OZ4HAM	**114,457**	**328**	**197**
JH1YTX	91,800	294	170
JA3YDS	30,174	121	94

DISQUALIFIED: KV4AM—Did not sign portable as required by rule VII. **RP2BDY, UP3BP, UP2BLV, UP3BU, UP1BZO, UR1RWX**—Incomplete reports and unverifiable QSO's, rule V and rule XIV.

CHECK LOGS: The following logs were used for cross-checking. Check logs and SWL logs are always appreciated. Thank you. DL2RM, DL6LAM, EA2BIM, EA3DAX, EA4KK, EA5ENG, EA6DE, EA7DUD, EO4AES, EO6AHG, EU5O, EV4AS, EV6AP, HA5FA, HA8KUC, HL9AA, KA4MOC, KA8SWD, KA9OPV, KH6CP/3, LA3WBA, LA5SM, LA8CJ, LA9VDA, LZ1OT, LZ1QV/MM, LZ1TR, N2BXV, N6UW, NE7B, OH1XX, OH2CL, OH5FA, OH5PT, OK1AD, OZ1FRR, OZ1HAS, OZ4ZT, OZ7GN, PA2NJN, PA3CNY, RA1AO, RA3VO, RA3VR, RA3VV, RA4NAI, RB5EV, RB5UU, RFØFWW, RL8PY, RT5UO, RW3DM, RZ3AC, RZ3AM, RZ3DM, RZ6AWP, SMØMC, SM2NTU, SM6KMD, SP1DMD, SP3CQP, SP3ZAB, SP4AS, SP4DC, SP6FER, SP6PCL, SP9CTT, SP9NH, SP9RF, UAØFF, UA3AGW, UA3AHA, UA3DQS, UA3DUA, UA3PB, UA3PP, UA3TAM, UA3TBM, UA3TO, UA3VAQ, UA3XBB, UA4LW, UA6HKN, UA6LLI, UA6RB, UA6WH, UA9FAR, UA9URF, UA9XY, UB4DWA, UB4EXZ, UB4HZZ, UB4TWL, UB4WWE, UB5CCB, UB5KCA, UB5PS, UB5QKZ, UB5UCH, UC2LB, UC2SO, UF6FP, UF7FWW, UH8AAW, UJ8JJ, UL7LM, UL8FWA, UP1BWG, UP2BV, UV3FD, UV3NB, UV6AS, UW1PA, UW3FW, UW3RR, UW3TP, UW6HC, UW9CL, UZØLWX, UZ3AYB, UZ3DWH, UZ3DXS, UZ3YWB, UZ4CXP, UZ4WWQ, UZ6HXK, UZ9AWZ, UZ9CYC, UZ9FWR, UZ9SWY, UZ9UZT, UZ9XWJ, UZ9XWW, UZ9ZWX, VE1CBF, VK6MD, W1MGP, WH6L, Y21UD, Y22TD, Y22TO, Y23LE/A, Y24PM/A, Y25IJ, Y26EO, Y26HO/A, Y26SO, Y32PH, Y38YE, Y38ZB, Y39TF, Y51YJ, Y53UN, Y54PL, Y54YH, Y56YF, Y56YO, Y57SD, Y57ZL, YO2ARV, YV5JEA, YV7PF, WB, UZ4CXP, UZ4WWQ, UZ6HXK, UZ9AWZ, UZ9CYC, UZ9FWR, UZ9SWY, UZ9UZT, UZ9XWJ, UZ9XWW, UZ9XWX, VE1CBF, VK6MD, W1MGP, WH6L, Y21UD, Y22TD, Y22TO, Y23LE/A, Y24PM/A, Y25IJ, Y26EO, Y26HO/A, Y26SO, Y32PH, Y38YE, Y38ZB, Y39TF, Y51YJ, Y53UN, Y54PL, Y54YH, Y56YF, Y56YO, Y57SD.

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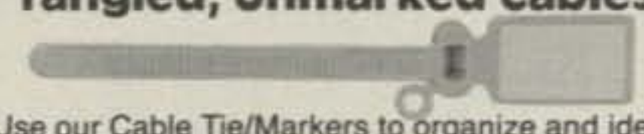

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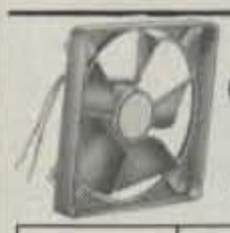

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CIRCLE 52 ON READER SERVICE CARD

CQ REVIEWS:

The Kenwood MC-85 Communication Microphone and Control Unit

BY JOHN J. SCHULTZ*, W4FA

Many amateurs might have noted that in Kenwood equipment advertisements there often appears a desk-console type microphone. It is the MC-85. The unit has not been advertised as a separate item, but it is an extremely interesting accessory item that can be used with any Kenwood transceiver as well as with almost any other brand of transceiver. The unit that was tested was, in fact, used with another brand of transceiver. The only modification necessary is to change the wiring to the pins on the microphone plug or, in some cases, to use a different type of plug.

Features

The MC-85 is interesting because it pulls together in one unit a lot of features both for the general control of a transceiver and for the processing of the transmit audio going into a transceiver. On the control side, it provides for both momentary PTT and electronically locked PTT for longer transmissions and remote up/down frequency tuning for transceivers with that capability. On the audio side, the unit starts out with a unidirectional electret microphone mounted on a short gooseneck. The microphone signal is amplified by an amplifier with an adjustable level control and then can be routed, if desired, to a compression amplifier which also has a level control.

A separate "tone" control switch allows for the selection of increased low-frequency roll-off when desired. Finally, a panel meter, actually calibrated in dB levels, monitors the audio output level. Push-button selection is provided so both the control and audio outputs of the unit can be routed to up to three transceivers.

Table I gives the specifications for the unit, while fig. 1 shows a block diagram.

Construction

The MC-85 is very neatly and sturdily constructed. The enclosure used is all metal except for the plastic side panels, but they have internal copper foil shielding for RF protection. Looking inside the unit one sees a single large PC board on which basically all of the circuitry and other components are mounted. The battery compartment is on the underside of the unit, and two screws have to be removed to access it. One interconnection cable is supplied with the unit which has an 8-pin plug. It will mate directly with all of the more recent Kenwood gear, adapters are available for mating with other Kenwood gear, and, as was mentioned before, the plug can be rewired or

*c/o CQ Magazine

The MC-85 is neatly laid out with slide-type level controls on the left, PTT and frequency control switches in the middle, and other switch functions on the right side.

Mic unit: Unidirectional electret condenser.
Output impedance: Approx. 700 ohms at 1,000 Hz.
Sensitivity (0 dB = 1 V/μbar 1,000 Hz): Mic level max. Comp. off −40 dB ± 6 dB. Comp. In −34 dB ± 6 dB.
Frequency characteristic: Normal—300 ~ 7,000 Hz (± 6 dB); Low Cut—approx. − 12 dB at 300 Hz.
Speech Compressor: Max. Compression level 35 dB ± 3 dB; Max. Input level −30 dB ± 4 dB.
Power supply: Batteries 6V (1.5 V × 4 "AA" cells, not supplied). (Battery life greater than 400 hour, estimated.)
Current consumption: Approx. 11 ma (transmit mode).
Dimensions (mm) & Weight: 177W × 55' (270)H × 157 (180)D, 1 kg (2.2 lbs.). (Figures in ( ) include projections.)

Table I– Specifications of the Kenwood MC-85.

Say You Saw It In CQ

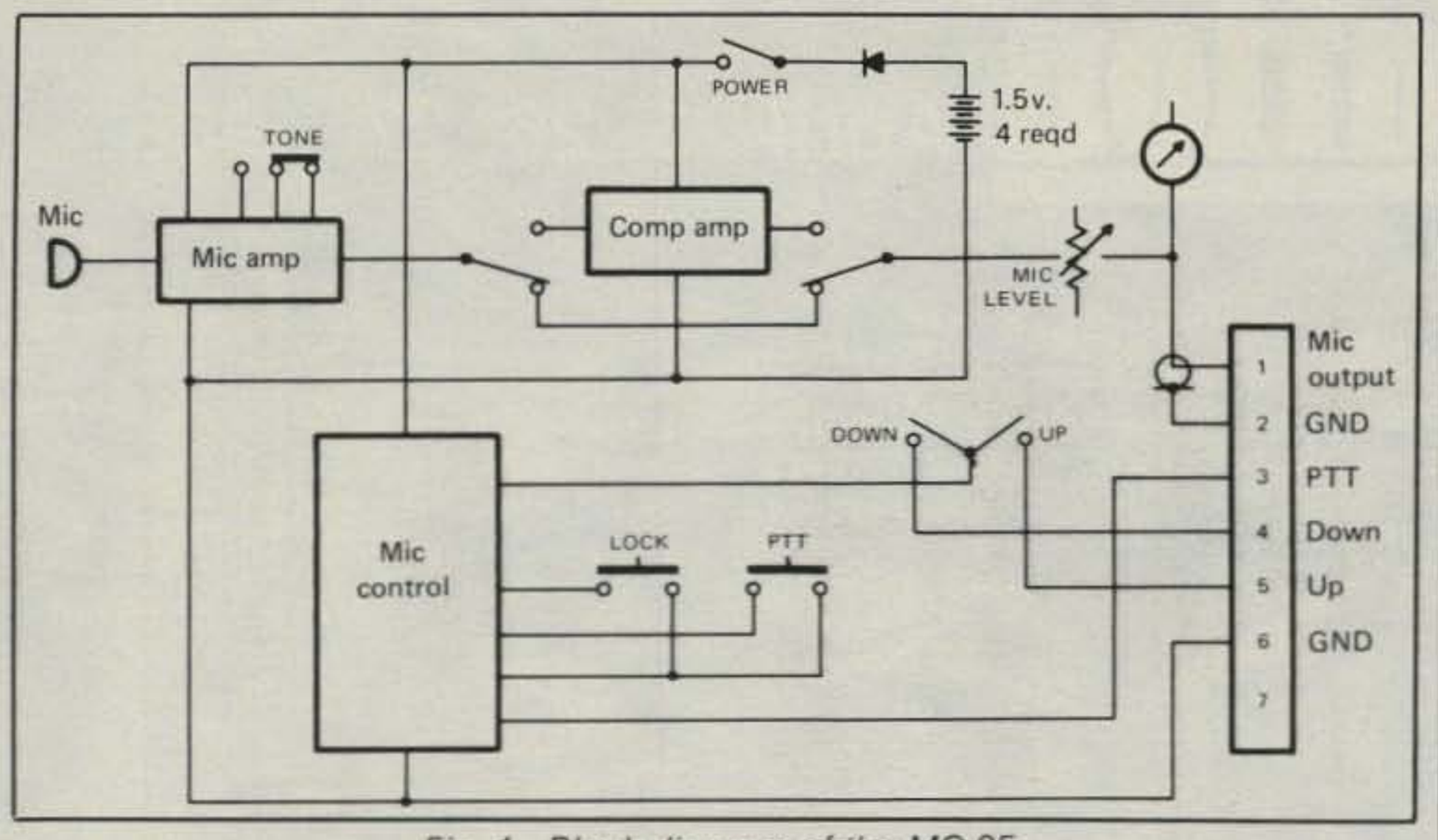


Fig. 1– Block diagram of the MC-85.

changed for mating with practically any transceiver.

Performance

The MC-85 performs as one would expect a piece of equipment from a reliable manufacturer to do. It is definitely not to be compared with some of the cheapie audio processing consoles that have come and gone on the CB market.

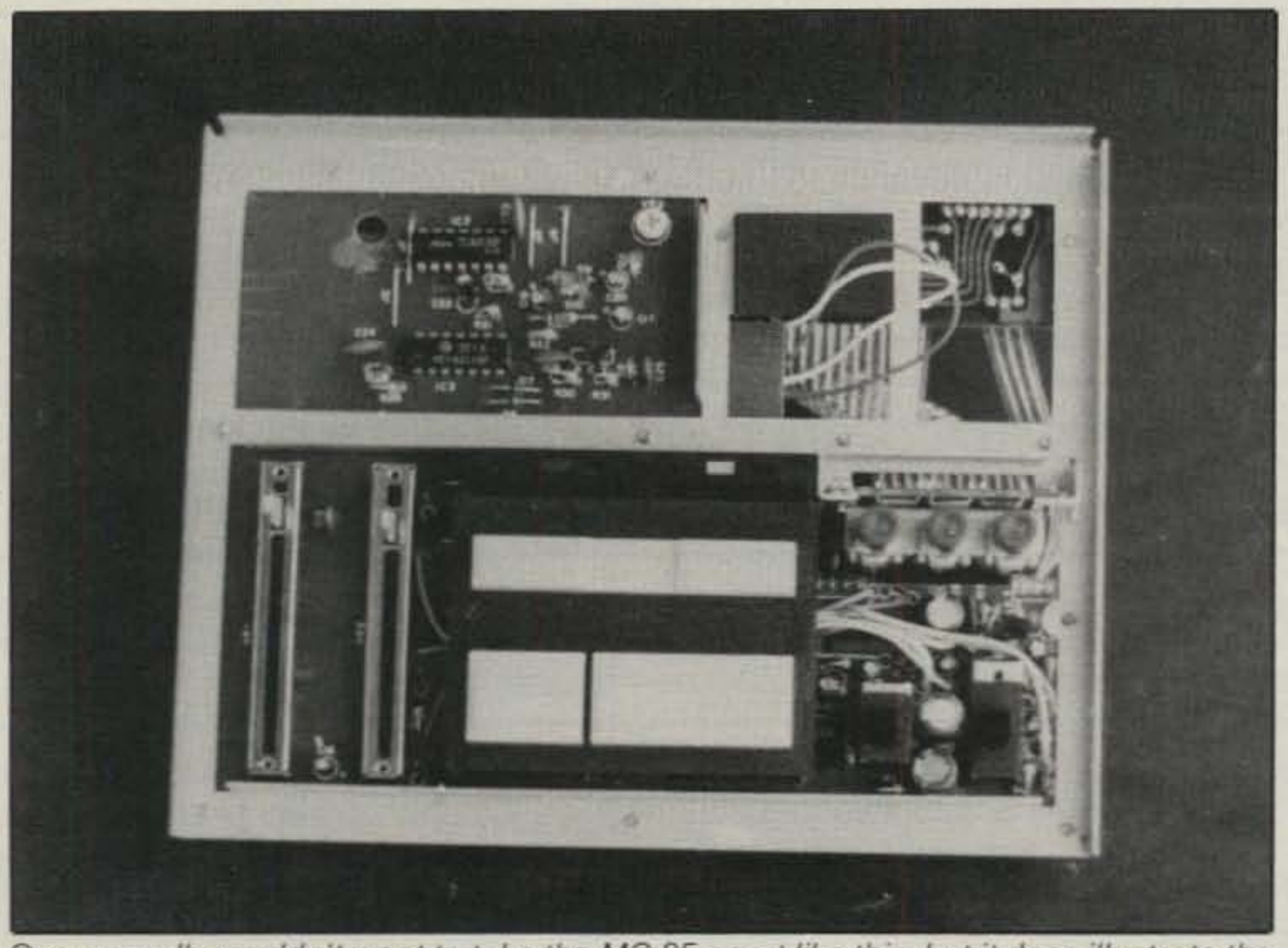
The electret microphone is quite directional, but it must not be "worked" too closely if clean, sharp audio is to be obtained. One must stay a good 5 inches away from it. Without the "tone" control switch or compressor activated, the audio is very clean with good high-frequency articulation. The low-frequency roll-off provided by the "tone" switch is very noticeable and definitely sharpens up the audio for a DX sound. The compressor limits the audio excursions, and one can definitely see a higher average reading being produced on the ALC meter on a transceiver. Between the use of the two level controls, the "tone" switch, and proper "working" of the microphone, one can produce smooth-sounding communications audio to quite a sharp, penetrating DX style of audio. In comparison with other microphone setups in the shack, the MC-85 equalled or out-performed them while doing on-the-air checks for "talk power." One thing that is absolutely essential, however, if a lot of time is not to be wasted, is that one have a means of monitoring one's transmitted audio. Most of the newer transceivers have such audio monitor circuits, but in other cases a separate monitoring setup is advisable. The MC-85 was tried in a setup with a fairly noisy background, but the compressor circuit could still be used very effectively. Apparently it has a fairly long gain hold time so one does not experience the effect, as with some compressor circuits, that if one pauses while talking for a second or two there is a sudden, dramatic buildup of background noise.

All of the controls are easy to use, well placed, and have a positive "feel." A green LED indicates a power "on" condition, and a red LED indicates that the PTT line has been activated.

The MC-85 was used in a station setup with a 2 kw linear amplifier, but no problems of any sort developed with RF feedback. Although a complete, detailed circuit diagram of the MC-85 was not supplied with the unit, the circuitry presumably must contain a generous amount of RF feedback protection features.

The measured current drain of the unit in standby was 7 ma with the compressor circuitry switched off and 9 ma with the compressor active. The operating current drain was a few ma more. These figures would, however, seem to make the 400-hour battery-life specification made by Kenwood (see Table I) sound rather optimistic.

On the same note, the only real fault to be found with the MC-85 is that it does not have any provision for the use of an external power supply. This is unfortunate since many transceivers do provide an accessory, well-filtered voltage output for ancillary equipment. On the other hand, perhaps Kenwood wanted to prevent users of the MC-85 from trying to power it from a single 6 VDC "plug" type power supply. Such supplies usually have a terrible AC ripple content and their use would make the MC-85 sound horrible. In any case, it would be extremely easy for any amateur who is a bit handy with circuitry to modify the MC-85 without drilling any holes so it can be powered from an external source. Another simple "no holes" modification that can be made, by those who find use for it, is to incorporate a two-tone test oscillator in the unit. There are certainly enough spare switch contacts on the pushbutton output selector switches that can be used to switch in/out such an oscillator.



One normally wouldn't want to take the MC-85 apart like this, but it does illustrate the neat construction of the MC-85. The PC board, which contains all components except the meter, is held by a metal frame which in turn mounts in the main enclosure.

Summary

The MC-85 is a definitely useful and functional accessory item. It costs a bit more than just a simple desk-type microphone ($89.95 amateur net), but it does, on the other hand, provide more sophisticated control and audio processing functions. I would endorse it as being a very good buy.

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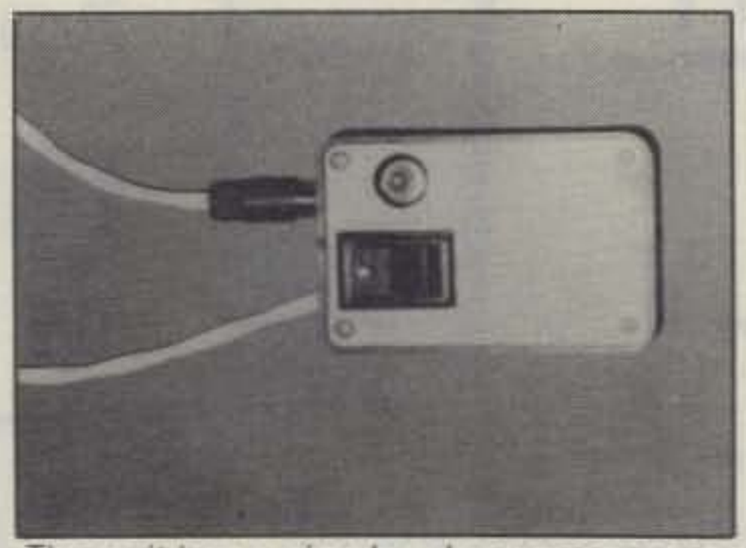
How To Build A Simple Microphone Interface/Test Oscillator Unit

BY JOHN J. SCHULTZ*, W4FA

The unit described in this article was built as the need arose to interface an electret microphone to an HF transceiver. As many readers might be aware, electret microphone elements are available at very reasonable prices (often less than a few dollars). In spite of their low price, the electret element often provides better clarity than a dynamic microphone element. Its inherently high output level, due to its internal amplifier, also often means that the microphone gain on a transceiver can be run at a lower level and less RF feedback problems will be encountered. In any case, as the little interface unit described in this article was developed, a few "bonus" features which some readers might find of interest were incorporated. They were primarily a simple, single frequency sinewave oscillator to allow simplified tune-up of an SSB of an HF transceiver and a passive speech equalizer circuit.

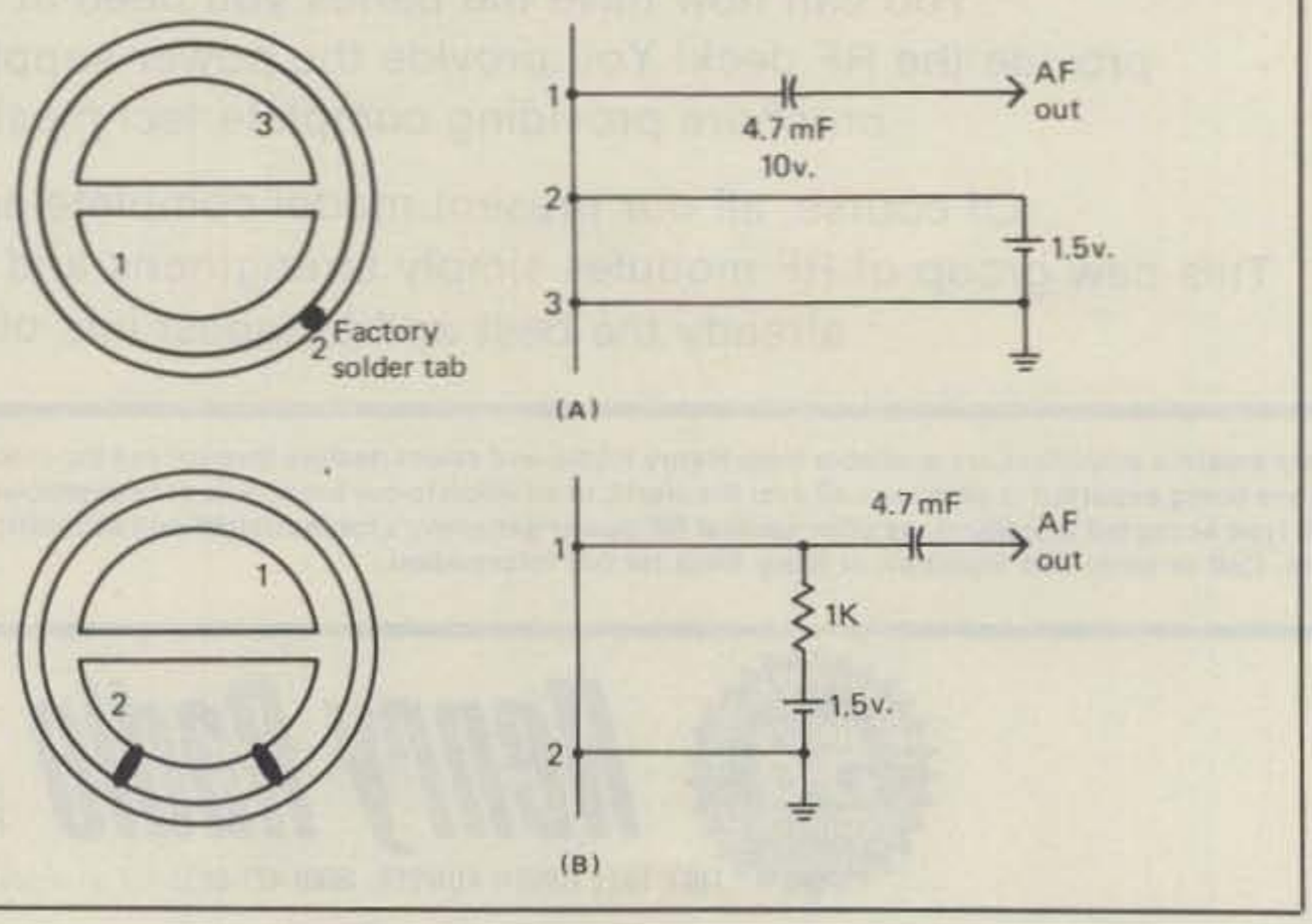
Fig. 1 shows the usual connections to the two most common forms of electret microphone elements. One form has three connection points (UE-16), and the other form (EM-6) has only two connection points. In the latter the DC voltage to power the internal amplifier in the microphone and the audio output of the amplifier are carried over a common lead. This means that a simpler two-conductor cable to the microphone can be used, but an AF isolating resistor has to be in the battery supply to the microphone element. But, as can be seen from fig. 1, the wiring to either type of microphone element is extremely simple. Many suppliers (e.g., Radio Shack) have electret microphone elements available. Often (as from Radio Shack) both "omnidirectional" and "unidirectional" response elements are available. Although the terms *omnidirectional* and *unidirectional* tend to be a nebulous thing since an element may be "omnidirectional" or "unidirectional" only within certain frequency ranges, the "unidirectional" response element is generally best for amateur radio applications since it tends to suppress background noise a bit.



The unit has a simple, clean appearance and is made small enough such that it can readily be handheld.

An electret microphone element can be mounted in almost any enclosure, the element protected from 'breath blasts" by using a half inch of foam plastic before its input port, and it will form a perfectly satisfactory microphone. In fact, the whole background of this article has to do with the author operating as W4FA/SV5, using a borrowed KWM-2 which came with a very dull sounding, original equipment dynamic microphone. Several "cheapy" dynamic-type CB microphones were purchased and tried but did not improve the transmitted audio. Finally, an electret element was tried with a home-brew microphone enclosure (a gutted, small plastic flashlight enclosure) and the interface unit described in this article. Suddenly the transmitted audio reports improved dramatically. Many S9 + signal reports had already been considered suspect and just a bit of "generosity" by amateurs needing an SV5 QSL.

Fig. 1–Connections for the usual three wire (UE-16) electret element (A) and a two wire (EM-6) electret element (B). The element backs are shown much larger than full size.



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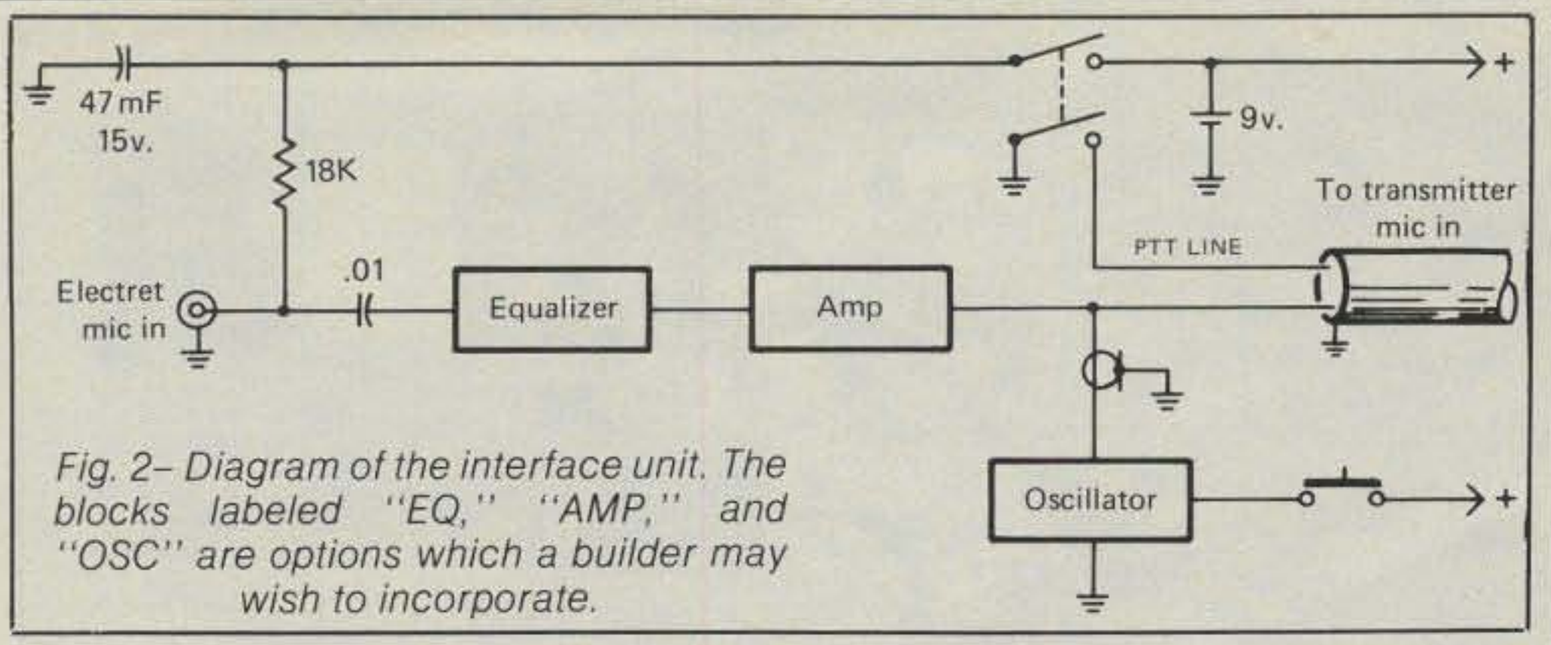

Fig. 2– Diagram of the interface unit. The blocks labeled "EQ," "AMP," and "OSC" are options which a builder may wish to incorporate.

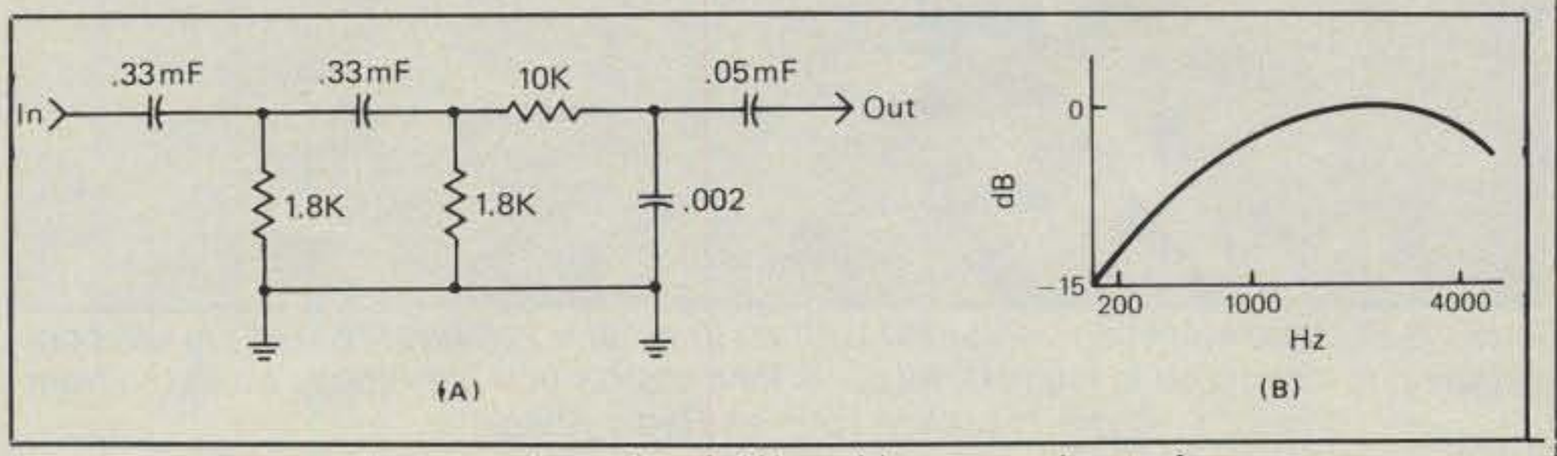

Fig. 3– Simple passive equalizer circuit (A) and its approximate frequency response (B). The actual response will vary with the actual input/output impedances involved. The circuit will by no means take the place of an active equalizer, but it can be useful.

However, the unsolicited good audio reports received after getting away from the dynamic microphones were really genuine.

Fig. 2 shows a practical version of the microphone interface unit. If one forgets the "EQ" and "OSC" blocks for a moment, it will be seen that the rest of the simple circuitry represents nothing more than a variation on the circuitry shown in fig. 1 for an EM-6 (two-wire) electret element. Since a 9 volt battery is used in the interface unit, the series resistor to the electret element has been increased considerably, to 18 K ohm. However, the increased resistance value was chosen not only to limit current flow to the internal amplifier in the electret element when using a 9 volt battery. It was found that by using a somewhat "soft" supply due to the 18 K ohm resistor, a mild form of speech compression action was achieved. To add a bit of further advantage to the situation, the 18 K ohm resistor meant, of course, that the battery drain was reduced to less than 2 ma. The coupling capacitor, shown as the usually recommended value of 4.7 mFd as in fig. 1, was drastically reduced to .01 mFd. The idea behind this was to reduce the low-frequency response of the electret microphone for two reasons—any sort of pronounced low-frequency response doesn't contribute to speech communication's effectiveness, and the "unidirectional" response of any electret microphone is sharper at the upper end of its frequency response range. Hence, letting the higher frequencies pass more favorably has a slight advantage in suppressing omnidirectional, low-frequency background noise response from the microphone. The DPST switch shown in fig. 2 simply completes the plus line to the battery and acts as a PTT switch to control a transceiver's PTT line.

The block marked "EQ" in fig. 2 contains an optional, completely passive RC speech equalizer circuit as shown in fig. 3. The circuitry is basically a two-section high-pass filter which rolls off its input response below about 1 kHz and a single-section low-pass filter section which rolls off above 1–2 kHz. The overall result of the circuit action is to provide a roughly 12 dB/octave reduction in low-frequency response, a mild rolloff for the higher frequencies, and a resultant modest "presence" response for the speech frequencies in 1–2 kHz range. Considering that it consists of only passive components, the equalizer is relatively effective, but it is definitely not absolutely necessary. The equalizer does introduce some loss due to its passive nature. It should be used only if the microphone preamplifier gain in a transceiver is sufficient to compensate for the introduction of the passive equalizer. Or, a further optional, output amplifier can easily be built into the interface unit if one wants to compensate for the loss in the equalizer circuitry. Fig. 4 shows a suitable circuit. The plus battery line to the amplifier is controlled by the DPST switch shown in fig. 2 in order to be sure that the amplifier does not continuously drain the battery. Something one should note, whether or not the output amplifier is used, is that if the equalizer circuit is incorporated the .01 mFd coupling capacitor shown in fig. 2 drops away. The left end of the input 0.33 mFd

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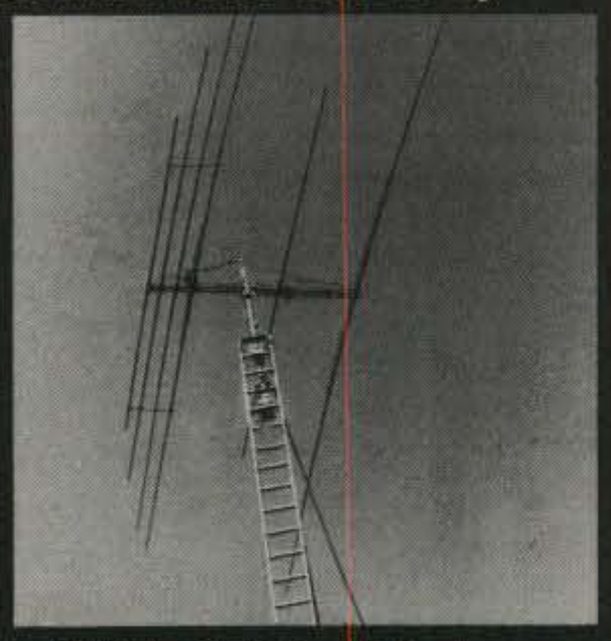

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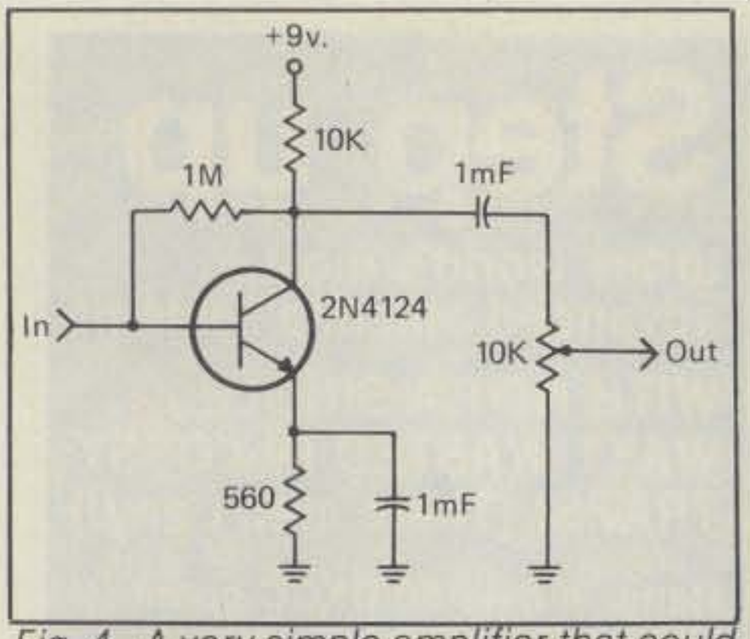


Fig. 4– A very simple amplifier that could be used after the passive equalizer of fig. 3 if more gain is needed to drive the microphone input on a transceiver.

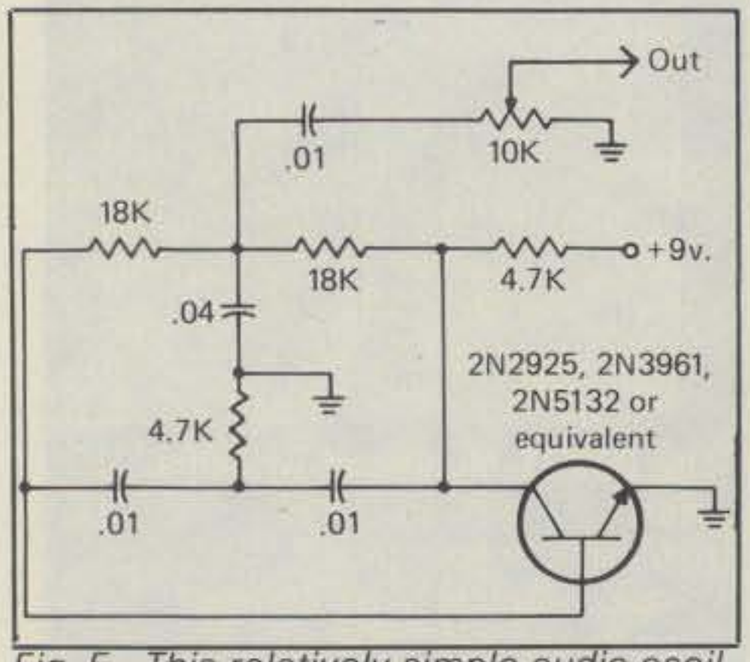
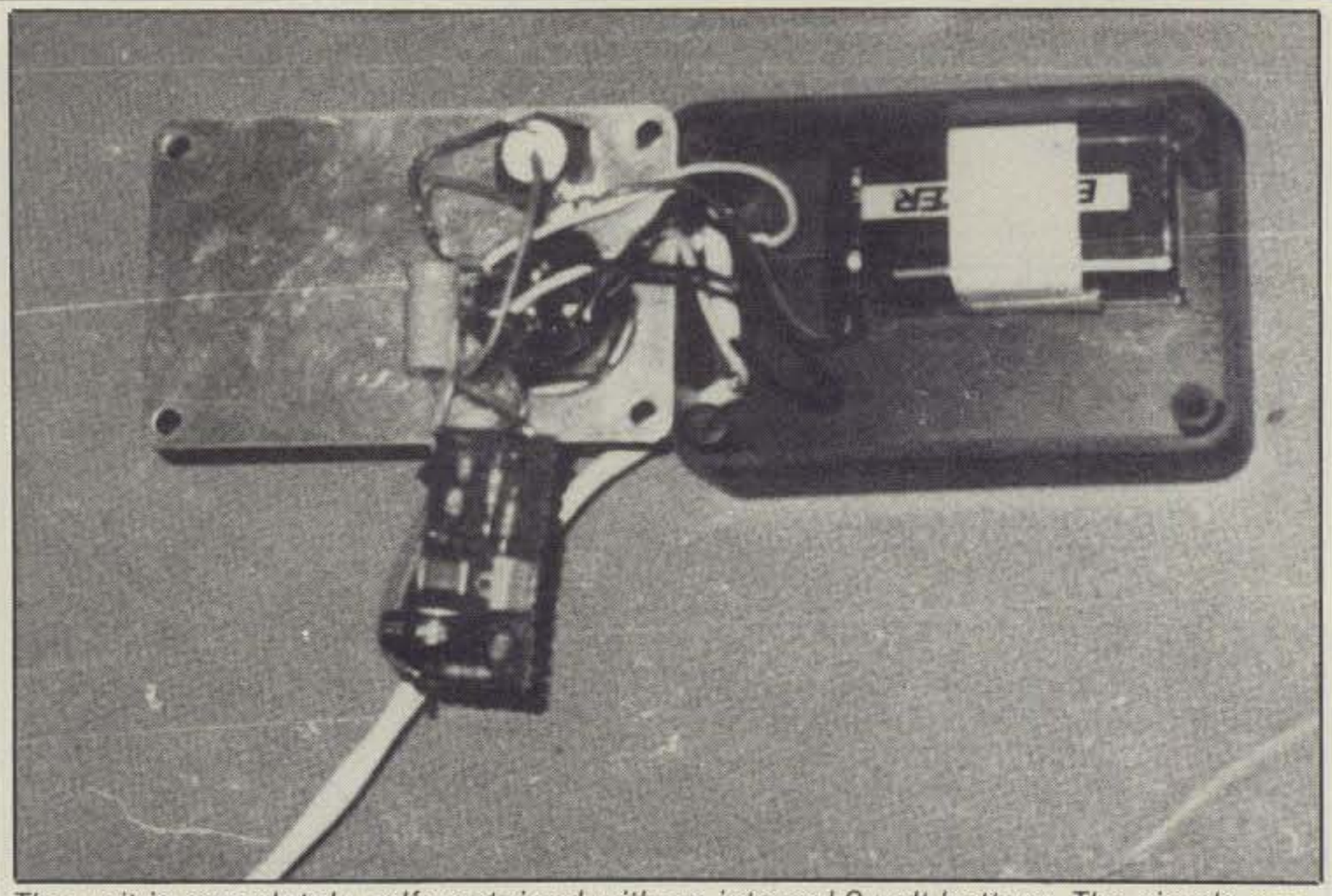


Fig. 5– This relatively simple audio oscillator circuit will produce a good sinewave signal for transmitter test or tune-up.

capacitor shown in fig. 2 couples directly to the junction of the 18 K ohm resistor and the lead from the electret microphone element.

The oscillator used in the unit is a simple bridged-T type as shown in fig. 5. It produces a reasonable low distortion sinewave output at about 900 Hz. The circuitry is extremely simple for a sinewave oscillator, and it uses a few less components than similar oscillators. This is due to getting "double duty" out of some components which form part of the bridged-T network and simultaneously act as coupling or biasing components. It is also a good circuit in that it turns on very quickly. As shown in fig. 2, a pushbutton switch is used to activate the oscillator.

The oscillator is used mainly for testing and tune-up of a transceiver. It's particularly handy when tuning up an HF SSB transmitter. Being a single frequency, sinewave oscillator, it causes an SSB transmitter to produce a carrier output, and one can adjust the PA controls (in the case of a tube-type output amplifier) and/or antenna tuning controls for minimum SWR without having to turn any switches on a transceiver. Of course, the DPDT switch in the unit has also to be thrown to ground the PTT line when using the oscillator. One could possibly locate a pushbutton switch with two sets of controls and use one to ground the PTT line, thus further simplifying operation.



The unit is completely self-contained with an internal 9 volt battery. The simple construction is discussed in the text. All parts for construction are readily available from parts outlets such as Radio Shack.

One photograph shows the outside of the unit, which is housed in a 3¼" × 2⅛" × 1⅛" metal/plastic case from Radio Shack (No. 270-230). In fact, all of the components needed for the unit are readily available from Radio Shack. (The DPDT rocker switch is their part No. 275-691, and the pushbutton switch is No. 275-609.) A regular phono plug was used to interface with the cable going to the microphone so different microphones could readily be tried. The shielded cable to the transceiver's microphone connector was permanently wired in place.

Another photograph shows the inside of the unit. The switches are mounted on the metal front plate of the enclosure. The 9 volt battery is held in place by back-to-back adhesive tape. A battery holder would take up too much space. The battery drain of the unit is so low that an alkaline battery should last well over a year in normal use. The electronic components are simply wired in point-to-point fashion on a small piece (roughly 1¼" × ¾") of perforated board stock. No special wiring procedures are necessary. However, to prevent wasted motions if one is going to construct the unit, one should sketch out on a piece of paper a simple pictorial, based on fig. 2, of the wiring to be followed.

The little interface unit described in this article can easily be constructed over a weekend if one has all the parts available. It has been very handy as an operating aid and can be made as simple or as elaborate as one wishes. CQ

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Here's an interesting way for you contesters to solve the dupe-sheet problem.

CONTEST DUPE SHEETS WITH LOTUS 1-2-3®

BY JERRY HAGEN*, N6AV

After using Lotus 1-2-3[1] for business purposes, I figured there must be a way to adapt the popular spreadsheet to prepare dupe sheets, which are required for most major contests such as the *CQ* World-Wide DX Contest. The Lotus 1-2-3 software package runs on virtually all business-type personal computers such as IBM PC family, NCR, Compaq, Heath/Zenith, Tandy 1000, and several others. The RAM memory requirement for Lotus 1-2-3 is 256K. The Lotus Symphony software could also be used and would provide some additional capability, but it requires much more RAM memory.

The objective was to create a dupe sheet which could be updated several times during the contest and which was relatively simple to use so that errors would be minimized. As fatigue usually arrives on the second night of a contest, simplicity was of major importance.

The spreadsheet was begun by defining column **A** of the spreadsheet as the input area. Being a single operator, all-band participant with a modest station, 400 contacts per band was sufficient, and this amount of QSO's can be placed on the standard 8½" × 11" tractor feed paper. This also limited the number of characters in a call to 9, which means a shortcut will have to be taken when entering a call such as WA6GLD/6Y5L or FS/W6SZN/FG! Lotus 1-2-3 users know that 9 characters is also the standard column width for spreadsheets, although this can be changed. If more than 400 QSO's per band is desired, then the sheet could be expanded by using larger paper or using two or three pages per band. When entering calls, it is best to set the keyboard for **Cap Lock**. It is also necessary to enter numeric calls (i.e., 8P6J) with a ' to justify the call properly. To prevent entry of calls in a wrong part of the sheet, the entire sheet is protected, and the range for 400 calls is unprotected using the **Range Unprotect** command.

After entering the calls, the "duping" is accomplished by the **data sort** command, which sorts the calls and places any duplicates together so one can be eliminated from the log. The numerical calls such as 5T5CJ or 9Y4VT are sorted first when using Lotus 1-2-3.[2] The tricky part of the sort was to set up a Macro so that the sort range does not have to be specified each time the sort is run. This was done by using the **End** keystroke and **Page Down** keystroke in the sort Macro shown by fig. 1. The disadvantage to this method is that at least one new call must be entered to the dupe sheet before using the Macro or it will "hang up" when invoked. If this happens, it is necessary to re-boot the PC.

One enhancement which could be made is to place a distinctive mark such as an asterisk by the QSO's that are duplicates. As of this date I could not find a way for this to be done within Lotus constraints. Perhaps someone will think of a method to do this in the future. In any case, the "*" would limit the spreadsheet space for calls, and it is not difficult to spot the duplicates.[3]

The next step is to move the calls from Column **A** of the spreadsheet to fill a standard page. A Macro with the **Move** command was used for this purpose. However, difficulty was encountered with the protected range being used. This was solved by unprotecting the new area (columns **B** through **H**) before the move. No move is necessary for Column **A**, as the entries are already there. After the move, the dupe sheet (fig. 2) is printed by Macro and the page is advanced for the next band. The calls are then moved to column **A** by the Macro (after unprotecting this range) so that additional calls may be entered. There may be an easier way to work around the protection problems encountered, but the method used seems to be relatively foolproof. To avoid late-night mistakes an automatic file save is built into the Macro, which completes the processing.

After experimentation, the Macros to accomplish all of the processing were combined into one rather lengthy Macro. This has worked well however, as it makes the duping less error prone. In the heat of a contest this is desirable (like putting the linear band switch on the same

```
\A      /DS~{END}{DOWN}~G
        /RUB5..H54~
        /MA55.A104~B5.B54~          To sort calls and
        /MA105.A154~C5.C54~         unprotect range
        /MA155.A204~D5.D54~         then move calls to
        /MA205.A254~E5.E54~         place 400 QSO's
        /MA255.A304~F5.F54~         on one page and
        /MA305.A354~G5.G54~         print the dupe
        /MA355.A404~H5.H54~         sheet.
        /PPRA1.H56~AGQ~
        /RUA55..A404~               To unprotect range
        /MB5.B54~A55.A105~          and move calls
        /MC5.C54~A105.A154~         back into column A
        /MD5.D54~A155.A204~         so additional
        /ME5.E54~A205.A254~         QSO's can be
        /MF5.F54~A255.A304~         entered.  The file
        /MG5.G54~A305.A354~         is then saved.
        /MH5.H54~A355.A404~
        /FS~R

\B      /REA5..A404~                To erase sheet
                                    after contest.
```

Fig. 1– Macros to sort and arrange the contest dupe sheet.

*9407 White Hemlock Lane, Matthews, NC 28105

Say You Saw It In CQ

```
B2O                          N6AV CONTEST DUPE SHEET      QSO'S=    122
                               BAND:  20 METERS
                             CONTEST: ARRL CW - 1985
  *****
4N4WRS    IOZUT     UZ1AWI
5N8FOC    I1WXY     UZ2FWA
5I5CJ     I2BBJ     UZ9AYA
5Z4MX     I2MQP     VP2EAG
8P6J      IK4EWK    VP2MGD
9Y4VT     JA3YBF    VP2MP
CT1BOH    JF1EQA    XE2MX
CX7BY     K4LTA/J7  Y33XB
DJ1XT     K5NA/KP2  YT3A
DJ2TI     KH6DW     YT3T
DJ9ON     KH6XX     YU1BAU
DKOIU     KL7RA     YU2BHI
DK1CU     KP4BZ     YU2CT
DK3SN     KU2C/V4   YU2DX
DK7ZT     KV4FZ     YU3DBC
DLOIU     LU8DQ     YU3QM
DL1YD     LZ2KTS    YU4GD
DL4BBO    N4BP/C6A  YV5A
DL7ON     N6TJ/EA9  ZF2AD
DL8GAM    OH4RH     ZK1XL
EA2IA     OH8AA     ZL1AMO
ER3A      OH8OS     ZS6ME
EU3A      OK1ALW
EU3P      OK1DBM
F6ARC     OK2BCI
FD6IRO    OK2BUY
G2QT      OK3AGP
G3FXB     OK3CGP
G3FXB     ON4UN
G3JKS     ON5IG
G3JXE     ON7KD
G3MXJ     OZ1LO
G3PFZ     OZ7YY
G3RPN     P42J
G3SXW     PAOGN
G3UJE     RB5SB
G3WPF     RR2RU
GM3JDR    SK3AH
GM3YOR    SK6JA
HA1KRR    SM5AQD
HA1SK     SM6DHU
HA5KKC    SM7DLZ
HB9ABA    SP7ITI
HB9AGA    TG9XHQ
HC2SL     TI2PZ
HG5A      UB4XWB
HG7B      UP1BZZ
HG9R      UP2BIM
HK1FCG    UP2BO
HW5PN     UT4UWV
```

Fig. 2– The completed Lotus 1-2-3 dupe sheet.

band as the exciter!): You can construct and name the Macro in a number of ways as the various Lotus 1-2-3 manuals and books describe.

A second Macro was made to erase the input range after the contest so the dupe sheet can be used again. The final touches were added by placing the titles on the spreadsheet and adding the QSO counter at the top right-hand portion of the sheet. This is accomplished by using the **Count** function of Lotus 1-2-3 with **@COUNT(A5 . . A404)** placed in the appropriate cell.

At this point the dupe checking is essentially complete and it can be used for contests. However, the routine can be made to function in a professional manner by adding the "menu driven" feature available in Lotus 1-2-3. This utilizes an "**Auto123**" file to provide a master menu on which the band to be duped is selected. When the band entry is completed and the dupe sheet is updated, the operator can go to the next band or return to the menu and then quit. As advanced 1-2-3 "Macro" experience is needed for this feature, it is beyond the scope of this article. If anyone is interested, a copy of the Macro's can be provided.

Once the spreadsheet has been completed and tested, it can be copied to make a dupe sheet for every band. Be sure to name each file so that it can be identified to the band, such as CQ2O for 20 meters. To avoid confusion, it is best to have a separate disk for each contest containing only the files for each band. When the contest is completed, it can be retained until the same contest comes up the following year.

The completed dupe spreadsheet seems to work well and provides a handy one-page dupe sheet to refer to during contests. Of course, care must be exercised when keying in the calls, and it is important not to skip a call. I checked this by entering to the dupe sheet only when a log page was complete. Thus, the number of contacts shown in the counter should always equal the number of QSO's on one log sheet times the last log page number. If these do not agree, you must compare the dupe sheet and log manually to locate the missing call. Using this system the QSO count is always a gross total before duplicates are eliminated. To correct a call in the listing is simple; just move the cursor to the call and replace with the proper call. Deleting a call is not simple, as it will disrupt the protection feature. However, it should not be necessary to delete a call. If an improper call is entered, wait until the next update and replace it with a valid call.[4]

After using Lotus 1-2-3 for two years, I have concluded its usage is only limited by one's imagination. I am sure there are many other ways to dupe contest logs with Lotus, but this one is simple and has worked well. You will also want to make a Lotus 1-2-3 Scoring Summary and add some additional features to the dupe sheet. So don't be bashful about trying something new. It will probably work!

Footnotes

[1] Lotus 1-2-3 is a registered trademark of Lotus Development Corp.

[2] The Symphony software package has the option of sorting with numbers first or alpha characters first.

[3] The Symphony software package has some additional capability that would aid this enhancement.

[4] Deletion can be handled by 1-2-3, but it involves more advanced Macro experience.

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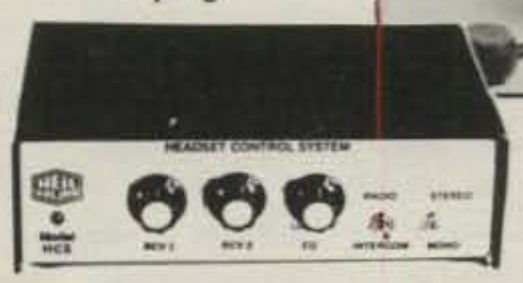

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Basic Trigonometry For The Commodore C-64 Computer

BY GEORGE E. BLACK*, WA0YJX

While building an inverted-Vee antenna, I adjusted the angle of the wires to obtain the best VSWR. Then I wondered, what was the Delta angle at the top? Also I had to figure the length of numerous guy wires to support the antenna mast.

For someone like me who was never a whiz at trigonometry, it was quite a chore. After getting the Commodore computer, I decided to try writing a trigonometry program to handle these calculations. The accompanying listing is the result of my efforts.

*325 East Main, Adrian, MO 64720

It can be used to figure just about any of the measurements needed for erecting towers, masts, guy wires, inverted Vees, and sloper antennas, plus almost anything else that needs indirect measurements using the right triangle.

Lines 10–90 set up the opening display. Be sure to type them in exactly as given, and in the rest of the listing be sure to insert spaces where shown. They also affect the screen display.

Here is a list of my printer's translation of the Commodore graphic symbols used. Be sure to observe them carefully, especially the <000> or pi in the formulas.

<RON> = Reverse On
<ROF> = Reverse Off
<DWN> = Cursor Down
<UP> = Cursor Up
<000> = (pi)

In response to the input prompts enter the known measurements of the right triangle. For the unknown elements press **RETURN.** A zero will appear. Select the appropriate option from the menu and read the answer. If what you need to know involves two sets of calculations, press **RETURN** to continue and again press **RETURN** for *each* input prompt. The second time the previous entries will reappear. Then choose your second option. CQ

```
1 REM--TRIGONOMETRY--BY GEORGE E. BLACK  (C) 1985--
10 POKE53280,6:PRINTCHR$(153)
20 PRINTCHR$(147)SPC(13)"<RON>-TRIGONOMETRY-<ROF><DWN>":SPC(34)"BB"
30 PRINTSPC(21)CHR$(47)CHR$(165)
40 PRINTSPC(20)CHR$(47)SPC(1)CHR$(165)
50 PRINTSPC(17)"C"SPC(1)CHR$(47)SPC(2)CHR$(165)"A"
60 PRINTSPC(18)CHR$(47)SPC(3)CHR$(165)
70 PRINTSPC(17)CHR$(47)SPC(4)CHR$(165)
80 PRINTSPC(15)"AA"::FORZ=1TO5:PRINTCHR$(163)::NEXT:PRINT"CC":SPC(35)"B"
90 PRINTSPC(10)"<DWN>:ENTER KNOWN FACTORS:
100 INPUT"<DWN>LENGTH OF  A  ";A:PRINT"< UP>"SPC(15):A
110 INPUT"LENGTH OF  B  ";B:PRINT"< UP>"SPC(15):B
120 INPUT"LENGTH OF  C  ";C:PRINT"< UP>"SPC(15):C
130 INPUT"ANGLE IN DEGREES  AA  ";AA:PRINT"< UP>"SPC(23):AA
140 INPUT"ANGLE IN DEGREES  BB  ";BB:PRINT"< UP>"SPC(23):BB
150 PRINT"<DWN><DWN> <RON> 1 <ROF>   DETERMINE A GIVEN B AND C"
160 PRINT"<DWN> <RON> 2 <ROF>   DETERMINE A GIVEN B AND AA"
170 PRINT"<DWN> <RON> 3 <ROF>   DETERMINE B GIVEN C AND BB"
180 PRINT"<DWN> <RON> 4 <ROF>   DETERMINE C GIVEN A AND B"
190 PRINT"<DWN> <RON> 5 <ROF>   DETERMINE ANGLE AA GIVEN A AND B"
200 PRINT"<DWN> <RON> 6 <ROF>   DETERMINE ANGLE BB GIVEN A AND B"
210 PRINT"<DWN> <RON> 7 <ROF>   DETERMINE ANGLE AA GIVEN A AND C<DWN>"
220 PRINT" <RON> 8 <ROF>   END PROGRAM
230 INPUT"<DWN>DESIRED OPTION";O:PRINTTAB(21)"< UP>ANSWER: 0"
240 IFO<1ORO>8THENPRINT"< UP>< UP>< UP>":GOTO230
250 ONOGOTO260,270,280,290,300,310,340,350
260 A=INT(SQR(C↑2-B↑2)/.01+.5)*.01:PRINT"< UP>"TAB(28)A:GOTO360
270 AA=TAN(AA*<000>/180):A=INT(B*AA/.01+.5)*.01:PRINT"< UP>"TAB(28)A
TO360
275 AA=INT(ATN(A/B)*180/<000>/.01+.5)*.01: BB=90-AA:GOTO360
280 X=SIN(BB*<000>/180):B=INT(C*X/.01+.5)*.01:PRINT"< UP>"TAB(28)B:AA=90-BB:GOTO
360
290 C=INT(SQR((B↑2)+(A↑2))/.01+.5)*.01:PRINT"< UP>"TAB(28)C:GOTO360
300 AA=INT(ATN(A/B)*180/<000>/.01+.5)*.01:PRINT"< UP>"TAB(28)AA;"DEG.":BB=90-AA:
GOTO360
310 C=INT(SQR((B↑2)+(A↑2))/.01+.5)*.01
320 Y=A/C:BB=INT((-ATN(Y/SQR(-Y*Y+1))+<000>/2)*180/<000>/.01+.5)*.01:PRINT"< UP>
"TAB(28)BB;
330 AA=90-BB:PRINT"DEG.":PRINT"< UP>":GOTO360
340 B=INT(SQR(C↑2-A↑2)/.01+.5)*.01:GOTO300
350 END
360 PRINTTAB(7)"<DWN><DWN>PRESS RETURN TO CONTINUE<DWN>"
370 PRINTTAB(5)"ANY OTHER KEY TO END PROGRAM"
380 GETA$:IFA$=""THEN380
390 IFA$=CHR$(13)THENGOTO10
400 IFA$<>CHR$(13)THENEND
READY.
```


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Here's a clip-and-save chart that will save you lots of time while helping you to put up a variety of antennas.

An Antenna Length Chart

BY GEORGE I. WAGNER*, K5KG

In the past few years I have had several opportunities to operate from a number of DX locations. In doing so, I have learned the importance of taking along the proper collection of tools, connectors, gadgets, and reference information to be able to make a quick repair or string up a needed antenna in an unfamiliar shack. Conversely, I have also learned the agony of lugging too much along, only to find it completely unnecessary and unused at the end of the trip.

The antenna length chart, which is the subject of this article, arose out of the need to have a convenient and ready reference, other than a weighty handbook, for measuring antenna lengths. This results from a number of experiences in trying to find a calculator, or a paper and pencil (typically in the dark and late at night), inevitable debates over what constants to use in the calculations, and finally the need to convert from feet to meters when only a meter tape was available, or vice versa. On two separate occasions I have discovered 160 meter dipoles of totally wrong lengths, and on an expedition to OJ0 in 1982, OH0RJ and I spent many hours calculating, cutting, and erecting 40 and 15 meter delta loops. This chart would have been a valuable asset in those circumstances.

This chart was developed after a brief reference to the various antenna handbooks in the shack, and a quick refresher on the current amateur frequencies, especially in the new 12, 15, and 30 meter WARC bands. The formulas used in the calculations, shown at the bottom of the chart, are based upon standard assumptions for wire antennas supported by end insulators.

The chart was developed using Visicalc (a registered trademark of VisiCorp), an electronic "spreadsheet" program on an Apple II+ computer. However, any spreadsheet program on a personal computer could have been used to do the job.

*P.O. Box 4312, Houston, TX 77001

ANTENNA LENGTH CHART BY K5KG

FREQUENCY	WAVELENGTH - FEET				WAVELENGTH - METERS			
(MHZ)	1/4	1/2	1/2+5%	FULL	1/4	1/2	1/2+5%	FULL
1.8	129.87	259.75	272.73	519.49	39.58	79.17	83.12	158.33
1.825	128.09	256.19	269.00	512.38	39.04	78.08	81.99	156.16
1.85	126.36	252.73	265.36	505.45	38.51	77.03	80.88	154.05
1.9	123.04	246.08	258.38	492.15	37.50	75.00	78.75	150.00
3.5	66.79	133.58	140.26	267.17	20.36	40.71	42.75	81.43
3.6	64.94	129.87	136.37	259.75	19.79	39.58	41.56	79.17
3.7	63.18	126.36	132.68	252.73	19.26	38.51	40.44	77.03
3.8	61.52	123.04	129.19	246.08	18.75	37.50	39.38	75.00
3.9	59.94	119.88	125.88	239.77	18.27	36.54	38.37	73.08
4	58.44	116.89	122.73	233.77	17.81	35.63	37.41	71.25
7	33.40	66.79	70.13	133.58	10.18	20.36	21.37	40.71
7.05	33.16	66.32	69.63	132.64	10.11	20.21	21.22	40.43
7.1	32.93	65.85	69.14	131.70	10.04	20.07	21.07	40.14
7.2	32.47	64.94	68.18	129.87	9.90	19.79	20.78	39.58
7.3	32.02	64.05	67.25	128.09	9.76	19.52	20.50	39.04
10	23.38	46.75	49.09	93.51	7.13	14.25	14.96	28.50
10.5	22.26	44.53	46.75	89.06	6.79	13.57	14.25	27.14
14	16.70	33.40	35.07	66.79	5.09	10.18	10.69	20.36
14.1	16.58	33.16	34.82	66.32	5.05	10.11	10.61	20.21
14.2	16.46	32.93	34.57	65.85	5.02	10.04	10.54	20.07
14.35	16.29	32.58	34.21	65.16	4.97	9.93	10.43	19.86
18	12.99	25.97	27.27	51.95	3.96	7.92	8.31	15.83
18.5	12.64	25.27	26.54	50.55	3.85	7.70	8.09	15.41
21	11.13	22.26	23.38	44.53	3.39	6.79	7.12	13.57
21.1	11.08	22.16	23.27	44.32	3.38	6.75	7.09	13.51
21.25	11.00	22.00	23.10	44.00	3.35	6.71	7.04	13.41
21.45	10.90	21.80	22.89	43.59	3.32	6.64	6.98	13.29
24.89	9.39	18.78	19.72	37.57	2.86	5.73	6.01	11.45
24.93	9.38	18.75	19.69	37.51	2.86	5.72	6.00	11.43
24.99	9.35	18.71	19.64	37.42	2.85	5.70	5.99	11.40
28	8.35	16.70	17.53	33.40	2.54	5.09	5.34	10.18
28.5	8.20	16.41	17.23	32.81	2.50	5.00	5.25	10.00
29	8.06	16.12	16.93	32.24	2.46	4.91	5.16	9.83

FORMULAS USED

1 METER = 3.281 FEET

LENGTH OF 1/2 WAVELENGTH ANTENNA (METERS) =

(300 * .95 * .5)/FREQ(MHZ) = 142.50/FREQ(MHZ)

LENGTH OF 1/2 WAVELENGTH ANTENNA (FEET) =

(300 * .95 * .5 * 3.281M/FT)/FREQ(MHZ)

= 467.54/FREQ(MHZ)

NOTE: 1/2 WAVELENGTH + 5% IS USED FOR INVERTED VEE ANTENNAS

Clip and save this chart for your records.

Say You Saw It In CQ

It is not necessary to go into the details of using the spreadsheet program. I will point out, however, to those unfamiliar with such programs, that they provide a convenient way to manage rows and columns of numbers and text, and for performing rapid arithmetic calculations on the numbers. In this chart, for example, once the formulas and frequencies were input, the antenna lengths were quickly calculated for each of the eight columns. The first version of the chart did not include the new WARC bands. Once I realized this omission, it was quite easy with the spreadsheet program to insert the additional frequencies and recalulate the entire chart.

For the benefit of those new to amateur radio, the chart shows the proper wire lengths for antennas at each significant amateur frequency in the HF bands. In general, vertical antennas are ¼ wavelength high, dipoles are ½ wavelength long, and loops are one full wavelength in circumference. In addition, the chart shows the ½ wavelength plus 5% distance. This is used to find the length of a dipole erected in an inverted-Vee fashion.

For convenience and durability, I have had a copy of the chart laminated in plastic. The chart printed in this article can similarly be cut out and laminated.

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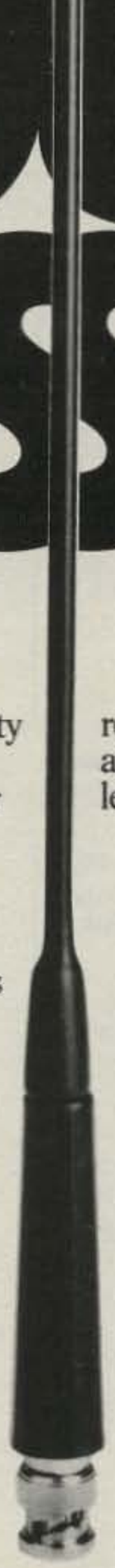

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CIRCLE 31 ON READER SERVICE CARD

Math's Notes

a feature by
IRWIN MATH, WA2NDM

A LOOK AT THE TECHNICAL SIDE OF THINGS

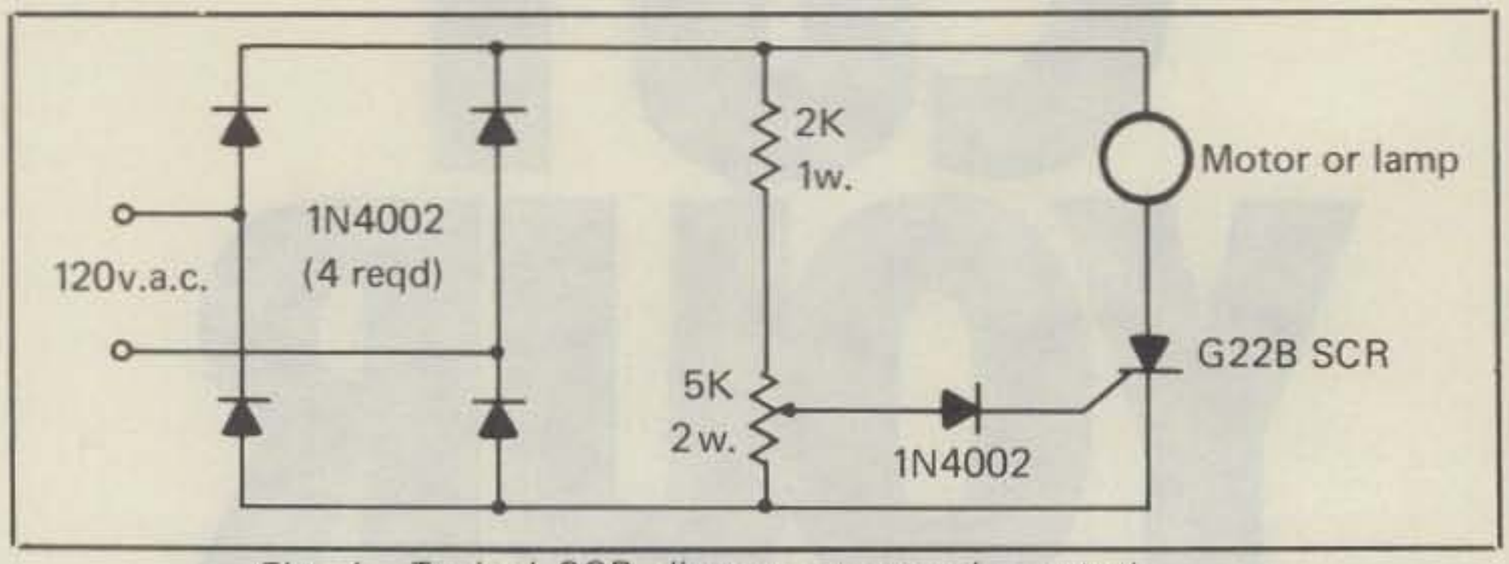

Fig. 1– Typical SCR dimmer or speed control.

Fig. 2– Waveshapes of fig. 1.

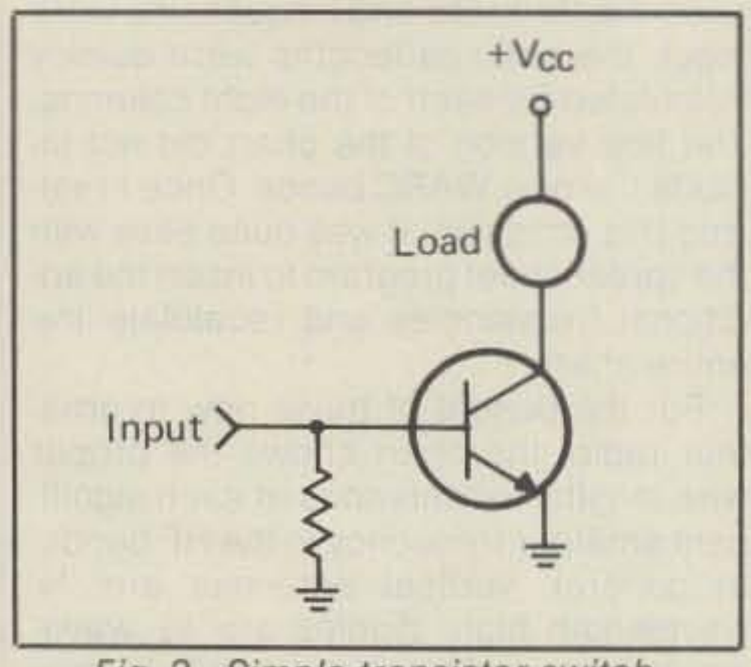

Fig. 3– Simple transistor switch.

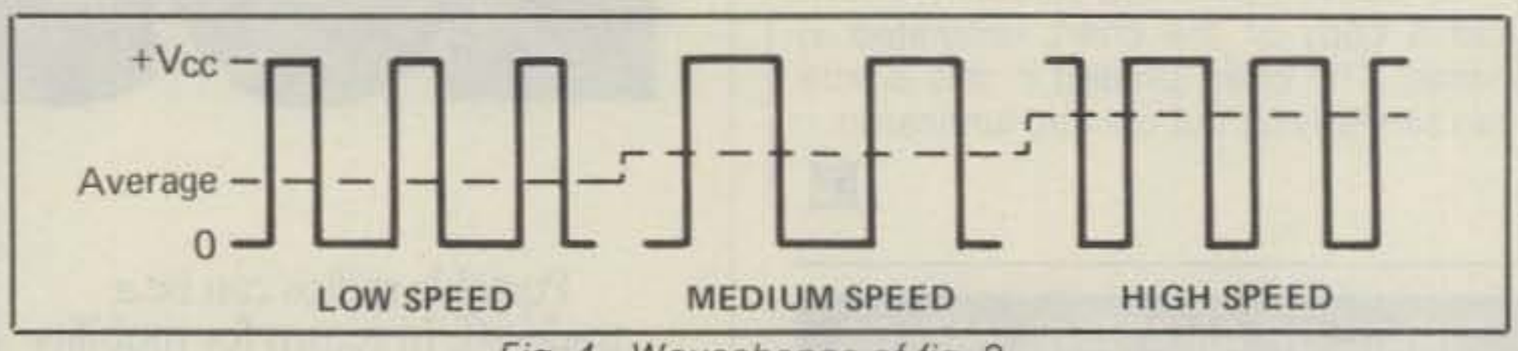

Fig. 4– Waveshapes of fig. 3.

Most experimenters are familiar with the motor speed controller/lamp dimmer circuitry of fig. 1. Here an SCR is used to control the duty cycle of the rectified AC line with the result that anything from zero to full power is applied to the load. Fig. 2 shows the waveshapes of this circuit, and it is interesting to note that peak power is always quite high. In dimmer applications this is not too important, but in speed controllers it is why the motor retains high torque at slow speeds. At any rate, this technique works well if you have AC available.

What about DC, however? Is there a similar way to achieve these results from battery-powered equipment? Happily, there is. Consider the circuit of fig. 3. When the transistor conducts, full power is applied to the load, and when it is cut off, zero power. If we now apply a 50% duty cycle square wave to the base of the transistor, the load has 50% average power, but like the SCR circuit, 100% peak power. Now, if the duty cycle of the square wave is varied from 0% to 100%, we have variable power applied to the load. Fig. 4 shows the waveshapes. Implementing such a control system is almost as easy as the SCR counterpart. Fig. 5 shows a configuration that will easily handle 5–8 amperes at 12 volts and will operate with high efficiency. It consists of a two-transistor multivibrator, driver, and power darlington output stage. The waveshapes at the center of the potentiometer's range are shown for clarity, and operation is fairly smooth. The output stage should be mounted on a chassis with proper insulating hardware. Since the transistor will only operate warmly at 5 amperes, a huge heat sink is not necessary. We built a unit on a small 3″ × 5″ minibox, and it was more than adequate for heatsinking.

The circuit operates at 100 Hz or so, but the frequency can be varied if desired by changing the two capacitors. When used as a motor speed control, the diode across the load shunts any reverse inductive spikes. DC controllers such as the one described here will find wide applications in portable or automotive applications and, as you can see, are fairly easy to build.

73, Irwin, WA2NDM

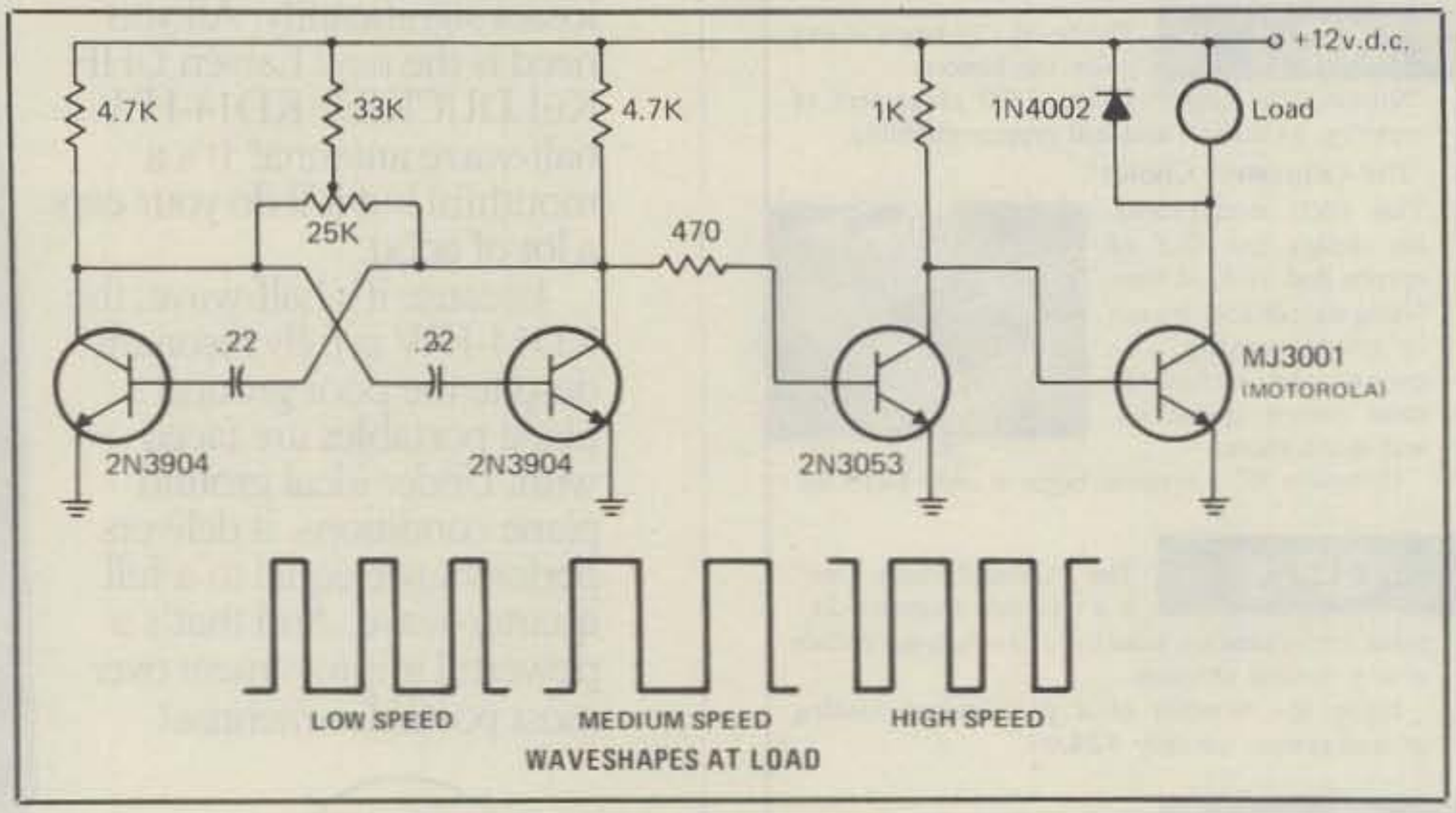

Fig. 5– Speed or power control for DC loads.

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The Tic-Tracer measures 8½" × 2¾" × 1" and operates on two AA batteries. Sensitivity range is 25 to 1500 VAC. Price is $39.95 post-paid. For more information, contact Louis & Beech, Box 19580, Detroit, MI 48219, or circle number 103 on the reader service card.

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CIRCLE 7 ON READER SERVICE CARD

Ticket Talk

a monthly feature by
FREDERICK O. MAIA, W5YI

INFO ON AMATEUR RADIO LICENSING

Station Identification and Call Signs

With millions of radio stations furnishing a variety of communication services throughout the world, it is necessary that their transmissions carry distinguishing call signs. These call signs have a threefold purpose. They identify the *nationality* of the station, they identify the *type* of station, and they identify the *individual* station. Radio call signs, in effect, are the "license plates" that identify communications traffic on the radio highways.

The need for station identification is emphasized by the fact that the United States, which leads all other countries in the use of radio, now has some 67 different kinds of radio services using many millions of licensed transmitters and providing land, sea, air, and space communication services. Call signs also are an aid to the enforcement of radio laws and regulations. Most stations in the world are required to identify themselves at intervals when they are in operation.

Not all radio stations require licenses. Radar stations, RF lighting, diathermy equipment, microwave ovens—to name a few—are exempt. We bet you didn't know that they were even considered to be "stations," but they are, since they radiate radio frequency energy.

Who Gets What Call Sign?

Since the early days of wireless telegraphy, starting with marine use, radio stations have had distinctive identification. Under international agreement, since 1927 the alphabet has been apportioned among the nations for basic call-sign use. The ITU, the worldwide telecommunications governing body, eventually started using numbers as prefixes as new countries emerged and they ran out of letters.

The United States, for example, is assigned three letters—K, N, and W—to serve as initial call letters for the exclusive use of all of its radio stations. It also shares the initial letter *A* with some other countries. Only call signs starting with *AA* through *AL* are allocated to the United States. While an amateur radio station starting with the *AL* prefix would be American, an *AP* prefix would identify a station in Pakistan! It doesn't take a DXer long to learn the country where each prefix is located. The letter *A* is also assigned to the U.S. Army and Air Force, *N* to the Navy and Coast Guard, and *K* and *W* to both government and nongovernment domestic stations.

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Broadcast Call Signs

Broadcasting stations in this country are assigned call signs beginning with *K* or *W*. Generally speaking, those beginning with *K* are assigned to stations west of the Mississippi River and in the territories and possessions, while those beginning with *W* are assigned to broadcasting stations east of the river. The few existing broadcast stations in variance with this system were assigned before the allocation plan was adopted. Station KDKA, the nation's first broadcast station, was actually a ham playing music from his garage in Pittsburgh, PA. That call sign continues to this day.

Broadcast stations have the privilege of requesting specific call signs as long as they are in good taste. In the early days of broadcasting, stations could be assigned three-letter call signs. Some interesting (and creative) call signs exist such as WACO in Waco, Texas; WIOD (Wonderful Isle of Dreams in Miami); WTOP, Washington, D.C. (at the top of the dial); KABL, San Francisco (for cable cars); etc. WSEX was initially turned down as not being in good taste, but the FCC reversed their decision when they learned that SEX suffixes were routinely assigned to amateur radio stations! The Commission later dropped their "good taste" restrictions completely!

Ham Call-Sign Assignment

Amateur radio call signs are generally assigned in sequence rather than on a request basis, although there have been periods when the FCC has allowed specific selections. Old timers (amateurs of more than 25 years) were allowed to select two-letter suffix call signs at one point, and Extra class amateurs could select specific available preferential calls in the mid-1970s, to name a couple of instances.

Reserving certain calls for individuals and groups of "such calibre as they might lend prestige to the Amateur Radio Service" was not unusual prior to the 1970s. W6TRW was assigned to the TRW Corporation, K2USA and W2USA were assigned to U.S. Army military stations, and K2UN to the United Nations. Even W3DOS and W3USS went to the Department of State Amateur Radio Club and a club located at the U.S. Senate. There were dozens of others.

Doing a favor of amateurs was one thing, but ultimately amateur call-sign issuance degenerated even further than that. In the early 1970s an amateur call-sign assignment scandal rocked the Commission! Their Chief of the Special Licensing Section in Gettyburg was found guilty of selling amateur radio call signs for $100 each! In 1978 the FCC made a hard and fast rule (Part 97.51) that amateur call signs would be assigned on a systematic basis only.

Although amateur call signs are for the purpose of identification of the station rather than the operator, call signs often are considered personal. They appear on correspondence and on automobile license plates. There are even grave stones bearing the cherished call signs of amateurs that have sent their final sign-off signal, "SK."

Call Signs For Sea Emergency

Before the turn of the century there was no special radiotelegraph call for sea emergency. One pioneer operator simply sent the letters "HELP" in code. In 1903 Italy suggested "SSSDDD" as a international radio emergency call. By 1904 a number of ships engaged in Atlantic trade were equipped with "wireless," as radio was then known, and they recruited land telegraph operators for sea duty. These operators resorted to the landline general call "CQ," meaning attention all stations. In 1904 the Marconi company added the letter *D* to signify distress. In 1912 the ill-fated *Titanic* flashed "CQD" as she headed toward the bottom!

German ships had been using "SOE" and in 1906 that country recommended those letters as an international distress call. This combination was deemed unsatisfactory to radiotelegraphy because the final dot was often obliterated by static or other interference. The American delegation to an international conference suggested "NC," which is the call for help in flag signaling.

However, international agreement was reached on "SOS," which became effective in 1906, though "CQD" continued to be used by British ships for some years thereafter. "SOS" does not mean "Save our Souls" or "Save our Ship," as sometimes claimed, any more that "CQD" meant "Come Quick Danger." Such calls are based on the speed and clarity with which they can be transmitted by radiotelegraphy.

For radiotelephone purposes—that is, voice transmission—the international distress call is "MAYDAY," which cor-

Say You Saw It In CQ

Group & License Class	Format*	Call-Sign Assignment Order
"A" Amateur Extra	2×1 and AA–AK 2×2	AA×1 to AK×1, KA×1 to KZ×1, NA×1 to NZ×1, WA×1 to WZ×1 & AA×2 to AK×2—Then Group B. (AH, KH, NH, WH reserved for Pacific area; AL, KL, NL, WL reserved for Alaska; and KP, NP, WP reserved for Atlantic possessions.)
"B" Advanced Class	2×2	KA0×2, KA1X2 then KB×2 to KZ×2, NA×2 to NZ×2, WA×2 to WZ×2—Then Group C. (AH reserved for Pacific, AL for Alaska, and KP for Atlantic. KC6, KG4, KX6 also reserved.)
"C" Technican/General	1×3	N×3, W×3—Then Group D. (KH, NH, WH reserved for Pacific; KL, NL, WL for Alaska; NP, WP for Atlantic.)
"D" Novice Class	2×3	KA×3 to KZ×3, WA×3 to WZ×3. (KH, WH reserved for Pacific; KL, WL for Alaska; KP, WP for Atlantic. Certain KC4's reserved for Antarctica.)

**Note: 2×1 means two-letter prefix followed by the U.S. radio district number and one suffix letter in alphabetical order. AA×1 means a two-letter prefix followed by the radio district number and one letter in alphabetical order. AA×1 to AK×1 means all prefixes between AA and AK such as AA, AB, AC, AD, etc., to AK followed by radio district number and one suffix letter. KB×2 means a two-letter prefix followed by the radio district number and two alphabetical letters—KB1AA, KB1AB, etc.*

Table I– Amateur Radio Service Call-Sign Assignment System by License Class.

responds to the French phase "M'aider," meaning "help me." It was adopted from a British proposal approved by an international convention in 1927. It has since been used by military as well as by civilian ships and aircraft.

Amateur Call-Sign System

The current call-sign assignment system has been in place for some eight years now. On March 24, 1978 the FCC said that they would no longer be issuing secondary call signs—nor would requests for specific call signs be honored. Provisions were made for amateurs to hold their existing primary call signs unless they requested a change, even if they were moving to new call-sign areas. Amateur stations with more than one call sign were ordered to submit one for cancellation. In an economy move, special event call signs were also discontinued.

The Commission said that all call signs would be strictly issued in the future according to a system of call-sign groups and prefix blocks. Call signs would always be selected by the FCC. Call-sign suffixes would be assigned in alphabetical sequence. When all assignments have been made from a particular block, the next assignment will be made from the next consecutive block within the group. When all call signs within a group have been assigned, then call signs from the next lowest group will be assigned the higher group.

Other provisions of the amateur radio service call-sign assignment system provide for:

1. A call sign will not be changed unless an amateur files an application (FCC Form 610) specifically requesting a change.

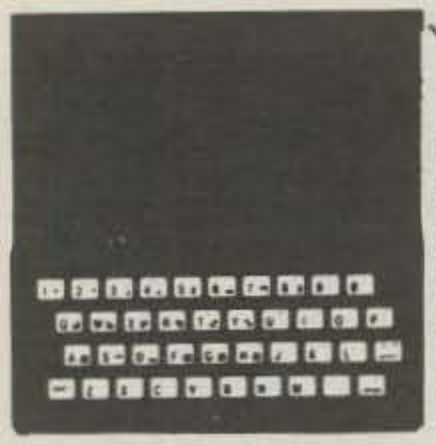
2. Licensees who are upgrading to a higher operator class are eligible to request a call-sign group change at the time of upgrade.

3. Licensees who are changing their address to a different radio district must make a choice to either . . .

a. retain their call sign or . . .

b. request a change. Failure to request a change means that you will retain your current call sign.

4. Licensees may retain the same call sign if the FCC Form 610 is received by the FCC within two years of the license expiration date.



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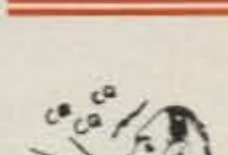

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CIRCLE 131 ON READER SERVICE CARD

CQ World-Wide WPX/S.S.B. Contest All-Time Records

BY STEVE BOLIA, N8BJQ, Director, CQ WPX Contest

The contest is held each year on the last full weekend of March. The All-Time Records will be updated and published annually. The method of computing final scores has changed several times since 1957. Data following the calls below are: year of operation, total score, and number of prefix multipliers.

WORLD RECORD HOLDERS

Single Operator

1.8	CG3MFA('85)	319,140	162
3.5	OH1RY/CT3('85)	2,816,754	453
7.0	CZ3BMV('85)	3,397,962	521
14	VP2EC('85)	5,011,668	646
21	HC9A('81)	6,025,770	615
28	CE6EZ('84)	5,437,936	644
AB	EA9IE('85)	8,744,508	708
QRP/p	H44R('84)	1,575,904	352

Multi-Operator Single Xmtr.

	VP2EC('83)	15,238,880	820

Multi-Operator Multi-Xmtr.

	KH6XX('85)	24,898,239	837

U.S.A. RECORD HOLDERS

Single Operator

1.8	K5UR('85)	122,664	228
3.5	KQ2M('85)	1,247,906	433
7.0	KI6P('84)	1,158,606	337
14	KG1E('85)	2,906,676	614
21	AI7B('82)	4,151,232	576
28	N5AU('82)	3,094,249	571
AB	KI6P('85)	4,483,792	568
QRPp	W8ILC('82)	1,044,012	459

Multi-Op Single Xmtr.

	N5AU('84)	6,301,977	759

Multi-Op Multi-Xmtr.

	AI6V('81)	12,529,608	728

CLUB RECORD
YU DX Club ('81) 41,003,768

WPX (Prefix) RECORD
ZZ5EG('85) 992

QRPp RECORD
H44R('84) 1,575,904

CONTINENTAL RECORD HOLDERS

AFRICA

1.8	EA8AFS('85)	282,048	156
3.5	OH1RY/CT3('85)	2,816,754	453
7.0	OH1MA/CT3('85)	2,775,020	445
14	CN8CY('83)	1,742,569	449
21	EL2AV('81)	4,617,530	557
28	CN8CY('82)	2,947,811	487
AB	EA9IE('85)	8,744,508	708

ASIA

1.8	RA9AKM('85)	79,074	69
3.5	5B4LP('84)	763,458	222
7.0	JA5BJC('84)	771,064	281
14	C44LP('85)	2,467,900	460
21	4X0U('81)	2,823,916	514
28	4X4UH('80)	2,718,760	440
AB	4X1X('82)	3,932,586	529

EUROPE

1.8	LZ2BE('84)	261,504	144
3.5	DJ4PT('81)	745,216	328
7.0	OH2KI/ZB2('85)	1,954,210	365
14	4N3ZV('81)	3,586,240	560
21	OH0BH('83)	3,977,684	501
28	YU3MY('80)	3,530,016	412
AB	Y24UK('82)	6,285,436	586

Multi-Op Single Xmtr.

AF	ED8RCT('85)	5,382,780	618
AS	UK9AAN('80)	11,152,020	660
EU	9A1ONU('80)	13,362,486	723
NA	VP2EC('83)	15,238,880	820
OC	KD7P/NH4('85)	10,484,712	568
SA	ZY5EG('84)	14,758,625	875

NORTH AMERICA

1.8	CG3MFA('85)	319,140	162
3.5	CZ3XO('85)	1,329,840	360
7.0	CZ3BMV('85)	3,397,962	521
14	VP2EC('85)	5,011,668	646
21	AI7B('82)	4,151,232	576
28	FG0DYM/FS7('80)	3,304,752	484
AB	N2BA/VP2M('85)	5,626,512	656

OCEANIA

1.8	T32AF('83)	16,872	37
3.5	KH6XX('78)	305,080	115
7.0	T32AF('84)	2,991,352	364
14	VR3AH('79)	3,526,153	437
21	VK4QK('80)	2,592,216	396
28	KB7IJ/KH2('82)	4,743,144	504
AB	AI6V/NH6('85)	6,677,500	500

SOUTH AMERICA

1.8	YV5JEA('84)	40,320	63
3.5	4M3AZC('84)	1,158,132	309
7.0	YY3BQS('83)	1,664,096	323
14	ZY5EG('83)	3,869,828	596
21	HC9A('81)	6,025,770	615
28	CE6EZ('84)	5,437,936	644
AB	PJ2FR('83)	7,484,994	594

Multi-Op Multi-Xmtr.

AF	9E3USA('69)	2,398,192	296
AS	UK9AAN('78)	10,702,776	532
EU	YZ1EXY('84)	14,503,141	881
NA	NP4A('82)	24,065,600	890
OC	KH6XX('85)	24,898,239	837
SA	ZZ5EG('85)	19,121,792	992

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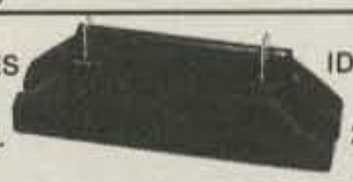

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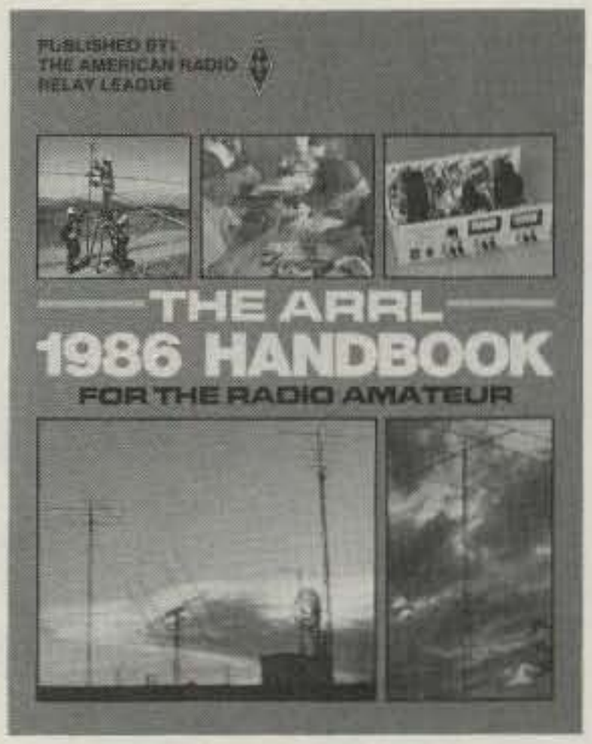

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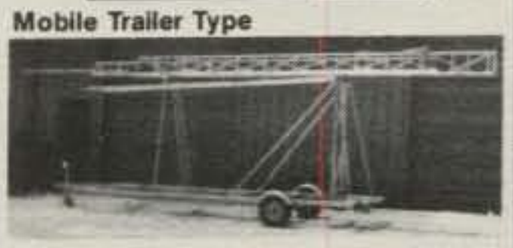

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CIRCLE 99 ON READER SERVICE CARD

CQ REVIEWS:

The Nye Multiband Antenna and MB-1-02 Matchbox

BY LEW MCCOY*, W1ICP

The William Nye Co. is marketing an all-band antenna designated the Nye Viking ANT-100 and Transmatch, the MB-1-02. Briefly, the antenna is one that will cover all the amateur and MARS bands, from 160 through 10 meters, and do the job with maximum efficiency. When I say "maximum efficiency," I mean just that. This antenna system has no traps or other gimmicks to make it work.

For more years than I care to remember I have been extolling the virtues of multiband antenna systems that use tuned feeders. Such antennas are so much better than the "trap" variety that there just aren't any comparisons. Granted, such tuned systems require a device such as a Matchbox or Transmatch, but modern-day antenna-system tuners are extremely easy to adjust. And now with modern transceivers that require an absolute 1:1 match in order to work at maximum efficiency, trap antennas can no longer be trusted to do the job.

The Nye antenna consists of 135 feet of No. 14 stranded copper wire with 100 feet of heavy-duty open-wire type twin lead for feeders. The antenna can be either center fed or end fed (in Zepp fashion). Also, the antenna can be mounted either horizontally (best way), as an inverted Vee, or as a sloper. These options are up to the individual amateur and the peculiarities of his location. There is a very rugged porcelain center insulator provided that has an eyelet for supporting the antenna. Also included are end insulators plus 100 feet of braided Nylon support rope. The antenna is rated at 2000 watts continuous duty.

The MB-1-02

The MB-1-02 Matchbox is a very compact 7"W × 4"H × 11"D unit. It will handle 200 watts under matched conditions. A circuit of the unit is shown in fig. 1. Essentially, the circuit is one designed to handle practically any load the amateur can encounter.

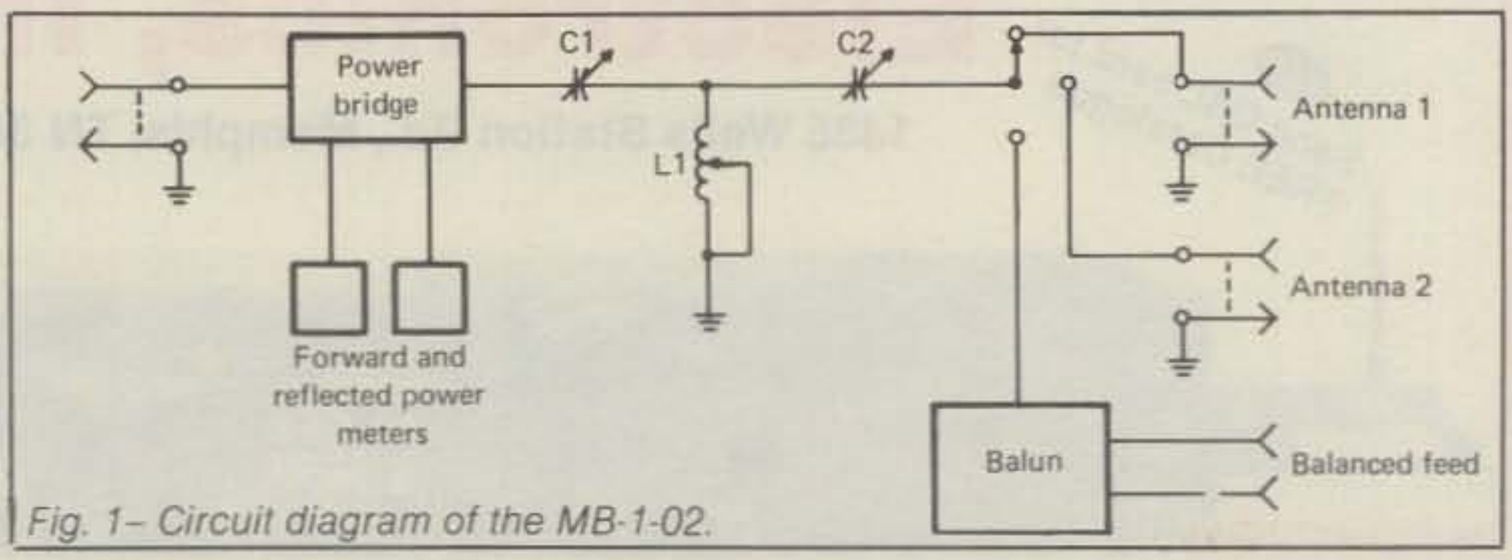


Fig. 1– Circuit diagram of the MB-1-02.

The front view of the MB-1-02 tuner with the top cover removed.

A power-type bridge is installed at the input side, and the bridge provides a method for measuring (via two panel-mounted meters) both reflected and forward power. Full-scale readings for the meters are 30 watts reflected and 150 watts forward. There is a rear-mounted switch that can be used to switch either of two coax-fed antennas or a balanced-fed antenna, such as the Nye ANT-100. The balanced feed is accomplished via a toroidal balun transformer.

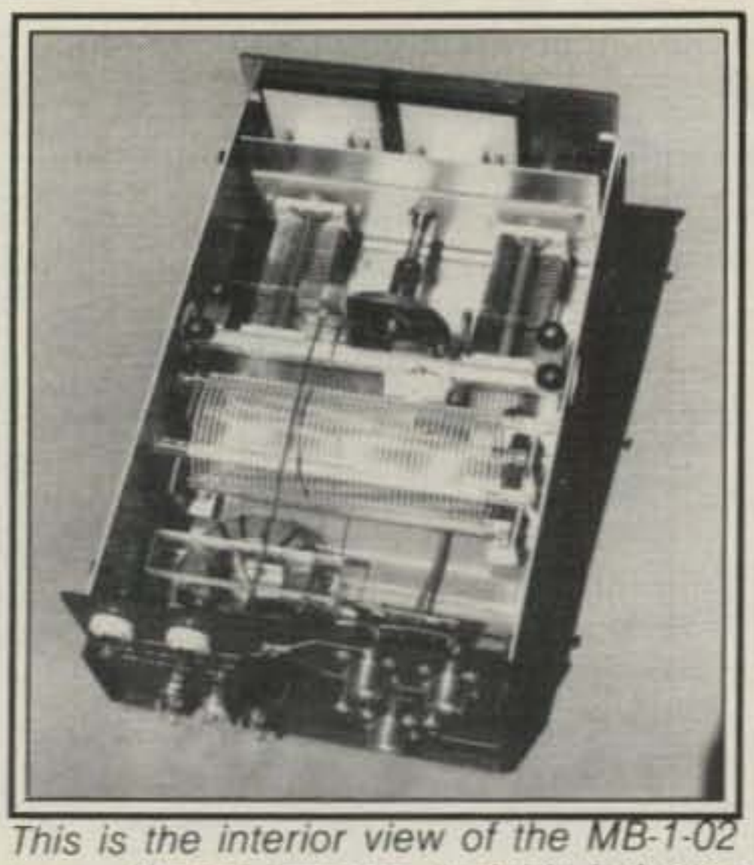
As I have pointed out many times in the past, the best Transmatches have adjustable inductors, as in fig. 1 at L1. The Nye tuner is unusual in this sense because it has a variable inductor, but not as the customary roller coil. Nye uses a sliding shorting bar that is front-panel adjusted. The shorting bar is moved up and down from the grounded end, providing the correct matching inductance for just about 99 percent of the loads one could encounter.

Nye points out in their instruction sheet, and correctly so, that one should avoid open-wire feeder lengths of ¼ wavelength. They even provide a table of lengths to avoid. With some types of Transmatches it is possible to get a perfect match with ¼-wave multiples, but it is easier if such lengths can be avoided. However, and this is important, in my tests I put up the antenna as it came (no trimming of lengths) and used the entire 100 feet of feeders. The MB-1-02 matched the system on all bands, including 160, to a perfect match. The adjustments were critical on a few bands, but the match came down to 1:1 in all cases.

As with any Transmatch, all adjustments must be done with the minimum power consistent to provide meter readings. The power is then increased after a matched condition is found. The MB-1-02 is rated at 150 watts output, and in my

*Technical Editor, CQ, 200 Idaho St., Silver City, NM 88061

Say You Saw It In CQ



This is the interior view of the MB-1-02 tuner. Please note the variable inductor with its shorting bar.

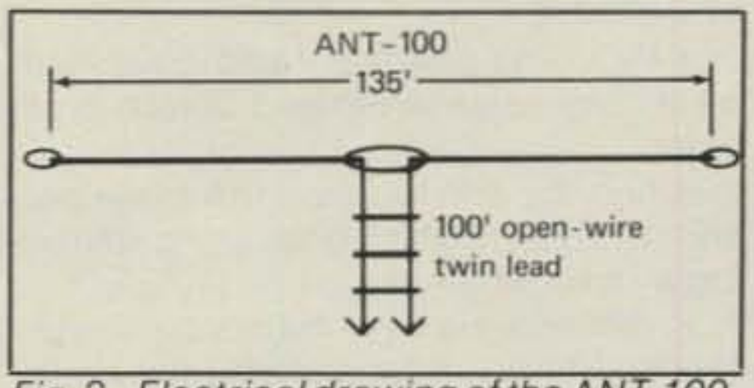


Fig. 2– Electrical drawing of the ANT-100.

tests I found that I could easily run 150 watts. In fact, I went up to 250 watts before I encountered arcing problems in the two capacitors.

If I were going to criticize anything, it would be that the antenna switch is mounted on the rear panel instead of the front. However, in my station layout it was no real problem to reach behind the unit to throw the switch (and one doesn't really change antennas that often).

I did lots of testing between the ANT-100 and my beam. The Nye antenna was suspended in an inverted-Vee configuration during the tests, and the center of the antenna was the same height as the beam. My beam has one element operating as a rotatable shortened dipole on 40 meters. It was very interesting to me that the Nye antenna would outperform the shortened dipole in most directions. Keep in mind that with 135 feet overall, the Nye antenna is a full wavelength on 40 meters (my rotatable coil-loaded dipole was only a quarter wavelength long).

I have used the Nye system for several months, and I cannot help but praise it very highly. Keep in mind that it can be used on any band and any frequency, and with the Matchbox it is capable of a 1:1 perfect match with no appreciable losses. That is an awfully tough combination to beat.

The ANT-100 kit sells for $39.50 and the MB-1-02 for $205.00. The antenna and MB-1-02 are manufactured by the Wm. M. Nye Company, Inc., 1614 130th Avenue N.E., Bellevue, WA 98005. CQ

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CIRCLE 82 ON READER SERVICE CARD

Our Readers Say:

RTTY Program Modification

Editor, *CQ:*

I read with interest the article in the November 1985 issue entitled "An RTTY Program for the Commodore C-64 Computer" by Floyd Sense, K8AC (page 48). Unfortunately, the program did not work on my model of the C-64.

On newer models of the C-64 computer it is necessary to put color information into color memory when directly POKEing into screen memory. In this particular program, Floyd uses this technique for the machine language "scroll screen" routine. His routine must have been written for one of the older C-64 computers as he did not include the necessary color memory routine. The result is that only one line of received and transmitted data appears on the screen. When scrolling happens, the data disappears from the screen and only the character being transmitted is shown in the "transmission" window.

The attached modification to Floyd's program will correct this problem for owners of later model Commodore 64 computers. It is only necessary to adjust line 100 for the additional data and adjust the data statements (lines 1330 thru 1381). The rest of the program works as stated in the article.

You may want to publish this correction for owners of the later model C-64. I do not know how to tell the difference other than if the program does not work then try the modifications.

Again I enjoyed the article and the issue of the magazine. I am new to the RTTY game so found the information most useful.

John L. "Monty" Wilson, KN7M
Omaha, NE

Courage HANDI-HAMS

Editor, *CQ:*

Dr. Deitchman's comments regarding the human service value of amateur radio in the October 1985 issue (Our Readers Say) are well taken. The Courage HANDI-HAM System is an international service organization bringing the excitement of amateur radio to persons with physical handicaps. We provide direct services to handicapped individuals in essentially three ways:

- Providing the educational materials needed to study for and pass radio amateur exams;
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- And, by encouraging the close personal fraternity which goes along with being a radio amateur.

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We welcome any inquiries, either from Human Service professionals, persons with physical handicaps who are interested in amateur radio, or from able-bodied amateurs who would be willing to work with persons with physical disabilities who have an interest in amateur radio. Over the last 16 years, with the help of thousands of willing volunteers, the Courage HANDI-HAM System has succeeded in introducing over 2000 new amateur operators to our fraternity. If you would like to help or if you know of someone who could use our services, please do not hesitate to contact us.

Keith M. Graham, K0HJC
Manager, Courage HANDI-HAM System
3915 Golden Valley Rd.
Golden Valley, MN 55422

```
100 GOSUB 1830:FOR X=828 TO 954:READ Y:POKE(X),Y:NEXT:POKE650,128

1300 REM ******************************
1310 REM * SCROLL SCREEN M.L. CODE *
1320 REM ******************************

1330 DATA 76,135,3,76,69,3,76,169,3
1340 DATA 162,0,189,144,5,157,104,5,173,134,2,157,104,217,232,224,0,208,239,189
1350 DATA 144,6,157,104,6,173,134,2,157,104,218,232,224,0,208,239,189,144,7,157
1360 DATA 104,7,173,134,2,157,104,219,232,224,88,208,239,162,0,169,32,157,192
1370 DATA 7,232,224,40,208,248,96,162,0,160,0,189,40,4,157,0,4,173,134,2,157
1380 DATA 0,216,232,224,240,208,239,169,32,162,0,157,200,4,232,224,40,208,248
1381 DATA96,162,0,189,25,5,157,24,5,173,134,2,157,24,217,232,224,39,208,239,96
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Just ask any of the many thousands of hams all over the world who have been enjoying my friendly good service for over a half a century. *73, Uncle Ben, W2SOH*

"Uncle Ben" Snyder, W2SOH
the head man of

HARRISON

"HAM HEADQUARTERS, USA®" *...Since 1925!*

- ***CALL ME...***
  (516) 293-7995
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Kenwood TH21AT, 31AT, 41AT

Kenwood TS-430S

Kenwood TR-2600, TR-3600

Kenwood TS-711A (2m)
TS-811A (70 cm)

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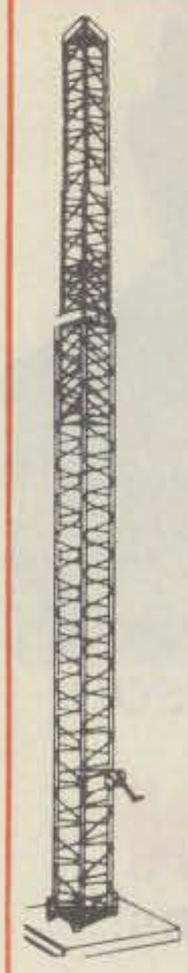


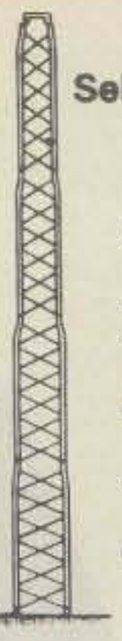
hy-gain CRANKUP SALE!

All Models Shipped Factory Direct—Freight Paid*!

Check these features:
- All steel construction
- Hot dip galvanized after fabrication
- Complete with base and rotor plate
- Totally self-supporting—no guys needed

Model	Height	Load	Sale Price
HG37SS	37 ft	9 sq. ft.	$CALL
HG52SS	52 ft	9 sq. ft.	$CALL
HG54HD	54 ft	16 sq. ft.	$CALL
HG70HD	70 ft	16 sq. ft.	$CALL

Masts—Thrust Bearings—Other Accessories Available—Call! Prices Shown Are Your Total Delivered Price In Continental U.S.A.!



ROHN Self Supporting Towers On SALE!

FREIGHT PREPAID

- All Steel Construction—Rugged
- Galvanized Finish—Long Life
- Totally Free Standing—No Guy Wires
- America's Best Tower Buy—Compare Save $
- Complete With Base and Rotor Plate
- In Stock Now—Fast Delivery

Model	Height	Ant. Load*	Weight	Delivered Price*
HBX40	40 ft	10 sq ft	164	$329
HBX48	48 ft	10 sq ft	303	$429
HBX56	56 ft	10 sq ft	385	$499
HDBX40	40 ft	18 sq ft	281	$399
HDBX48	48 ft	18 sq ft	363	$489

***Your Total Delivered Price Anywhere in Continental 48 States. Antenna Load Based on 70 MPH Wind.**

Tri-Ex®

These rugged crankup towers now available from Texas Towers! All models available On Sale for tremendous savings to you!

To save on freight costs, all towers are shipped directly from the Tri-Ex factory to you!

Check these features:
- **All steel construction**
- **Hot dip galvanized after fabrication**
- **Complete with base and rotor plate**
- **Totally self-supporting—no guys needed**

Model	Height Up	Down	Wind Load	List	Sale
W36	36.0 ft	20.5 ft	9.0 sq ft	$694	$579
WT51	51.0 ft	20.5 ft	9.0 sq ft	$1154	$899
LM354	54.0 ft	21.0 ft	16 sq ft	$2010	$1599
LM470D (Motorized)	70.0 ft	22.0 ft	16 sq ft	$4195	$3199
DX86 (Motorized)	86.0 ft	23.0 ft	25 sq ft	$7200	Call

US TOWER CORPORATION

Formerly Tristao Tower Co.

MA-40
40' tubular
Regular $745
SALE! $549

MA-550
55' tubular

Will handle 10 sq. ft. antennas at 50 MPH winds.

Regular $1245
SALE! $899

IN STOCK FOR IMMEDIATE DELIVERY

CALL FOR INFORMATION ON ALL OTHER MODELS

RG-213U

$.29/ft $279/1000 ft Up to 600 ft via UPS

- RG-213/U—95% Bare Copper Shield
- Mil-Spec Non-contaminating Jacket for longer life than RG8 cables.
- Our RG-213/U uses virgin materials.
- Guaranteed Highest Quality!

RG-8X

$.19/ft $179/1000 ft

- RG8X—95% Bare Copper Shield • Low Loss
- Non-contaminating Vinyl Jacket Foam Dielectric

Coaxial Cable Loss Characteristics (DB/100 ft)

Cable Type	Imped.	10MHz	30MHz	150MHz	450MHz
RG-213/U	50	.6	.9	2.3	5.2
RG8X	52	.8	1.2	3.5	6.8
RG-58/U	52	1.4	1.9	6.0	12.5
½" Alum	50	.3	.5	1.2	2.2
½" Heliax	50	.2	.4	.9	1.6
⅞" Heliax	50	.1	.2	.5	.9

HARDLINE/HELIAX™

Lowest Loss for VHF/UHF!

½" Alum. w/poly Jacket	$.79/ft
½" LDF4-50 Andrew Heliax ™	$1.79/ft
⅞" LDF5-50 Andrew Heliax ™	$3.99/ft

select connectors below.

HARDLINE & HELIAX ™ CONNECTORS

Cable Type	UHF FML	UHF MALE	N FML	N MALE
½" Alum	$19	$19	$19	$25
½" Heliax ™	$25	$25	$25	$25
⅞" Heliax ™	$49	$49	$49	$49

AMPHENOL CONNECTORS

Silver PL259 ..... $1.25
UG21B N Male ..... $2.95 UG23D N Female $2.95

Antenna Wire & Accessories

Solid Copperweld 12 ga. $.12/ft 14 ga. $.10/ft.
Stranded Copper 14 ga. $.10/ft 16 ga. $.09/ft
Stranded 14 ga. $.10/ft 16 ga. $.09/ft
¼ mile 18 ga copper-clad steel wire $30
6 inch heavy-duty end insulator ..... $2.00/ea.
Dog-bone insulator ..... $.79 Coax seal $2.50

Van Gorden

1:1 Balun ..... $11 Center Insulator $6
Dipole Kits D80 $31/D40 $28
Short Dipole Kits SD80 $35/SD40 $33
All-band Dipole w/ ladder line $29
G5RV $49.00

ALPHA DELTA

DX-A 160-80-40 Sloper $49

CUSHCRAFT

A3 3-el Tribander Beam	$209
A743 30/40mtr Kit for the A3	$75
A4 4-el Tribander Beam	$269
A744 30/40mtr Kit for the A4	$75
R3 20, 15, 10mtr Vertical	$259
AV5 80-10mtr Vertical	$99
D40 40mtr Dipole	$149
40-2CD 2-el 40mtr Beam	$279
A50-5 5-el 6mtr Beam	$79
215 WB NEW 15-el 2mtr Beam	$75
3219 19-el 2mtr Beam	$89
220B 17-el 220MHz Beam	$89
424B 24-el 432MHz Beam	$75
ARX2B 2mtr Vertical	$39

hy-gain

Discoverer 2-el 40-mtr Beam	
Discoverer 3-el Conversion Kit	
EXPLORER-14 SUPER SPECIAL	
QK710 30/40 mtr. Add-On-Kit	
V2S 2-mtr Base Vertical	
V4S 440MHz Base Vertical	
TH5MK2S Broad Band 5-el Triband Beam	
TH7DXS 7-el Triband Beam	
TH3JRS 3-el Triband Beam	
205BAS 5-el 20-mtr Beam	
155BAS 5-el 15-mtr Beam	
105BAS 5-el 10-mtr Beam	
204BAS 4-el 20-mtr Beam	
64BS 4-el 6-mtr Beam	
18 AVT/WB 80-10mtr Vertical	
18HTS 80-10 mtr Hy-Tower Vertical	
23BS 3-el 2mtr Beam	
25BS 5-el 2mtr Beam	
28BS 8-el 2mtr Beam	
214BS 14-el 2-mtr Beam	
2BDQ 80/40 mtr Trap Dipole	
5BDQ 80-10 mtr Trap Dipole	
BN86 80-10 mtr KW Balun W/Coax Seal	

Limited Quantities purchased at old prices. Call for current prices.

HUSTLER

6BTV 80-10 mtr Vert $129 5BTV 80-10 mtr Vert $109
4BTV 40-10 mtr Vert $89 G7-144 2-mtr Base $119
G6-144B 2-mtr Base $89

Mobile Resonators	10m	15m	20m	40m	75m
400W Standard	$16	$17	$19	$22	$26
2KW Super	$20	$22	$25	$29	$39

Bumper Mounts - Springs - Folding Masts in Stock!

BUTTERNUT ELECTRONICS CO

NEW HF4B "Butterfly" Compact Beam $189 -delivered (cont. USA)

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HF2V 80/40 Meter Vertical Antenna $129 Delivered (Continental USA)
- Optional 160 Meter Resonator Kit Model TBR 160 $49

Free Shipping On Butternut Accessories Also When Purchased With Antenna

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KT34XA 6-el Broad Band Triband Beam	$489
2m-14C 14-el 2-mtr Satellite Antenna	$89
2m-16LBX NEW-16-el 2-mtr Beam	$99
2m-22C NEW-22-el 2-mtr Satellite Antenna	$119
432-30LBX NEW-30-el-432 MHz Antenna	$99
435-18C 435 MHz Satellite Antenna W/CS-2	$119
435-40CX 435 MHz Satellite Antenna w. CS-2	$159

MOSLEY

TA-33 3-el Tribander	$239
TA-33JR 3-el Tribander	$189
PRO 37 7-el Tribander Beam	$469
S 403 3-el 40-mtr Beam	$699

MINI-PRODUCTS HQ-1 $159

ROTORS

Alliance HD73 (10.7 sq ft rating)	$119
Alliance U110 (3 sq ft rating)	$49
Telex CD 45II (8.5 sq ft rating)	$Call
Telex HAM 4 (15 sq ft rating)	$Call
Telex Tailtwister (20 sq ft rating)	$Call
Telex HDR300 Heavy Duty (25 sq ft rating)	$Call
KLM EL-3000 Moon Tracker Elevation Rotator	$369
Kenpro KR400 Azimuth Rotator	$129
Kenpro KR500 Heavy Duty Elevator Rotator	$159
Kenpro KR600 Azimuth Rotator	$199
Kenpro KR2000 Heavy Duty Azimuth Rotator	$379
Kenpro KR5400 AZ/EL Rotor Package	$259
Kenpro KR5600 Heavy Duty AZ/EL Rotor Pkg	$329

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Standard 8 cond cable $.19/ft (vinyl jacket 2-#18 & 6-#22 ga)
Heavy Duty 8 Cond cable $.36/ft (vinyl jacket 2-#16 & 6-#18 ga)

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10 ft Stack Sections

20G $39.50	45G $112.50
25G $49.50	55G $134.50

All 20G, 25G, 45G and 55G Accessories In Stock at Discount Prices - CALL!

Foldover Towers

Model	Height	Ant Load*	Price
FK2548	48 ft	15.4 sq ft	$899
FK2558	58 ft	13.3 sq ft	$949
FK2568	68 ft	11.7 sq ft	$999
FK4544	44 ft	34.8 sq ft	$1199
FK4554	54 ft	29.1 sq ft	$1299
FK4564	64 ft	28.4 sq ft	$1399

25G Foldover Double Guy Kit $249
45G Foldover Double Guy Kit $269
*Above antenna loads for 70 MPH winds and Guys at Hinge & Apex.

All Foldover Towers Shipped Freight Prepaid Continental USA! Foldover Prices 10% Higher West of Rockies.

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3/16 EHS Guywire (3990 lb rating)	$.15/ft
1/4 EHS Guywire (6650 lb rating)	$.18/ft
5/16 EHS Guywire (11,200 lb rating)	$.29/ft
5/32 7 × 7 Aircraft Cable (2700 lb rating)	$.15/ft
3/16 CCM Cable Clamp (3/16" or 5/32")	$.45
1/4 CCM Cable Clamp (1/4" Cable)	$.55
1/4 TH Thimble (fits all sizes)	$.45
3/8EE (3/8" Eye & Eye Turnbuckle)	$6.95
3/8 EJ (3/8" Eye & Jaw Turnbuckle)	$7.95
1/2 × 9EE (1/2" × 9" Eye to Eye Turnbuckle)	$9.95
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1/2 × 12EE (1/2" × 12" Eye & Eye Turnbuckle)	$12.95
1/2 × 12EJ (1/2" × 12" Eye & Jaw Turnbuckle)	$13.95
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Heavy Duty Steel Masts 2 in OD - Galvanized Finish

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12 in Wall	$29	$49	$59	$79
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- **40 Memory Channels**

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TH31AT 220 MHz
TH41AT 440 MHz
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ONLY $199!

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B23	2M	No	2W	30W	$ 79
B215	2M	Yes	2W	150W	$259
B108	2M	Yes	10W	80W	$159
B1016	2M	Yes	10W	160W	$249
B3016	2M	Yes	30W	160W	$199
C22	220	No	2W	20W	$ 79
C106	220	Yes	10W	60W	$179
C1012	220	Yes	10W	120W	$259
D24	440	No	2W	40W	$179
D1010N	440	No	10W	100W	$289

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RS7A	5	7	49
RS12A	9	12	69
RS20A	16	20	89
RS20M	16	20	109
RS35A	25	35	135
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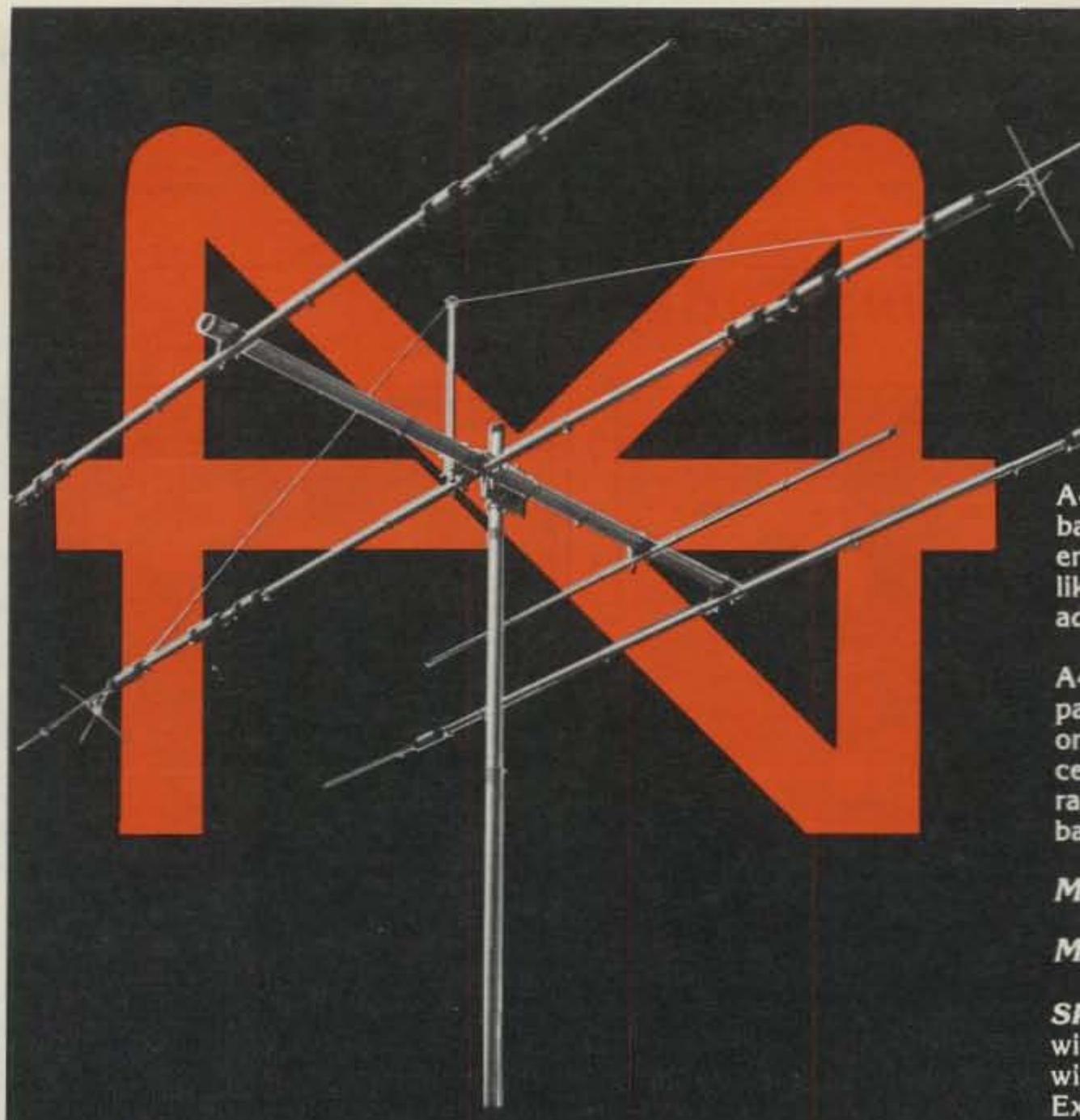

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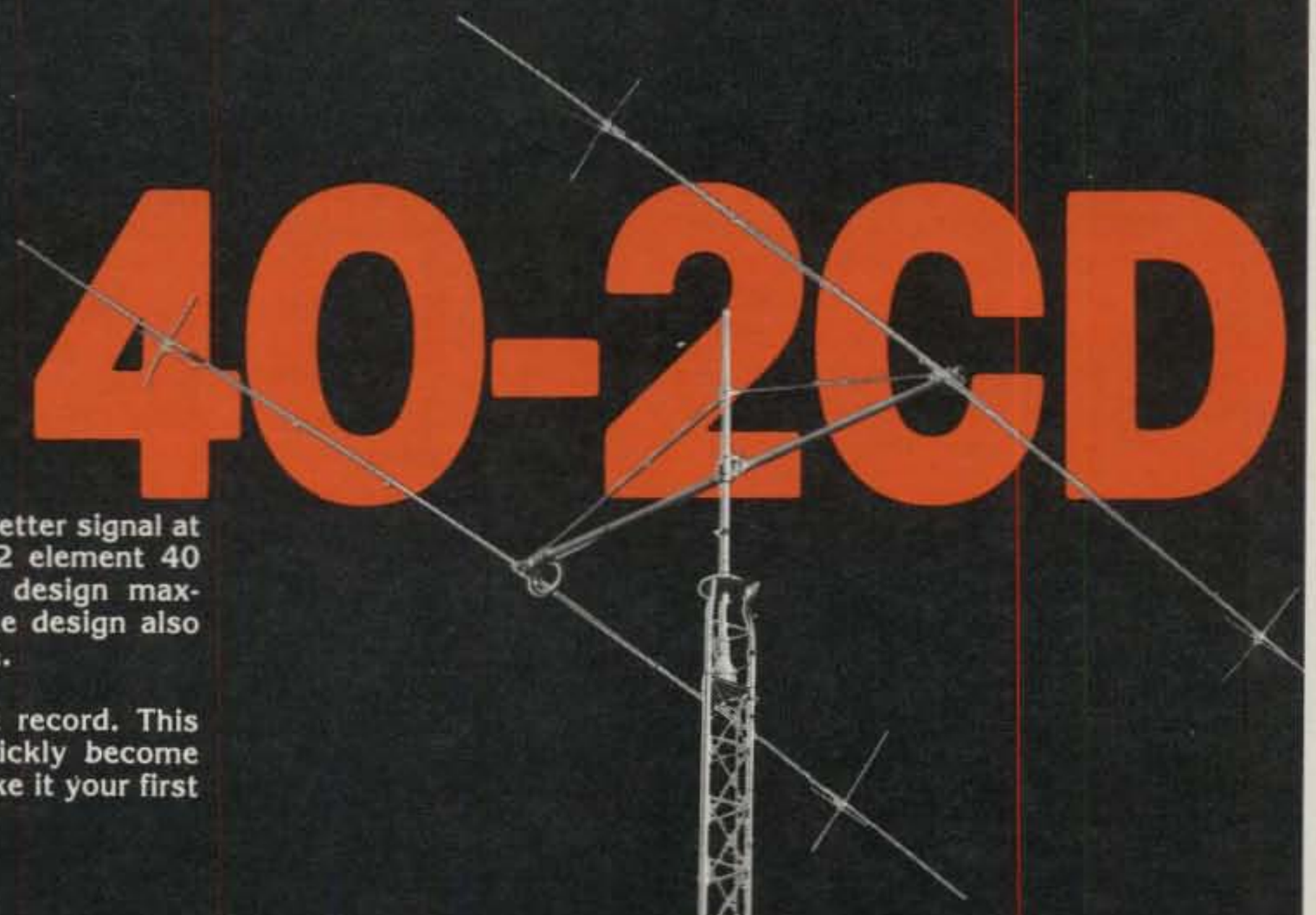

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World of Ideas

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A LOOK AT THE WORLD AROUND US

HF Mobiling Today

The ides of March and the approaching spring season kindle many amateurs' thoughts of vacations, weekend jaunts, and the refreshing pursuit of HF mobiling. Considering those facts plus the various influences directing many of us towards a sort of "life on wheels," such mobiling ideas are both logical and attractive. Our home setups are often subjected to antenna limitations or power-line noises, for example, while household commitments pull available time from on-the-air operating enjoyment. Likewise, numerous amateurs commute over large distances several days a week or lunch in an auto during favorable weather. Such patterns may admittedly be rather eclectic, but those are the ideal times for reaping maximum benefits from "low band" operations. The point I'm illustrating is simply using one's available time and opportunity to maximum advantage rather than allowing "away from home inconveniences" to minimize amateur radio pleasures. HF mobile capabilities allow one to enjoy almost any HF band from the auto, and many times during a day's most favorable DX periods or from an otherwise unavailable "top choice" location. This area is one of amateur radio's most public-service-oriented and classic interests, and it's open to all licensees from Novice to Extra class.

The recent evolution of all solid state and broadband transceivers opened a completely new era in HF mobiling. These compact units can be fitted into most modern vehicles, remote tuned from their microphone, and operated in an almost carefree manner. Similarly, their instant-on capabilities allow one to jump right into the action regardless of a trip's length, a feature which in itself can rekindle one's original enthusiasm for HF operations.

Two of the main factors influencing fully rewarding HF mobile activities are mating one's lifestyle with amateur radio interests and assembling a smooth operating setup for use during those times. Some typical examples here are early-morning and late-afternoon DXing, operating CW with a smooth electronic keyer, enjoying the challenge of QRP with a whip antenna, SWLing with a full-coverage transceiver, or even assembling a full OSCAR setup for fixed mobile operation. If you enjoy homebrewing rigs and using them on the air, mobile operating again offers unlimited possibilities for self expression. In fact, I personally continue to enjoy both in-country and DX contacts on 30 meters while using my simple 5 watt transceiver described in June 1983 *CQ* magazine. The tiny rig is mated with a pocket-size "spy key" strapped to the auto's seat. Lunch-hour DXing couldn't be more rewarding!

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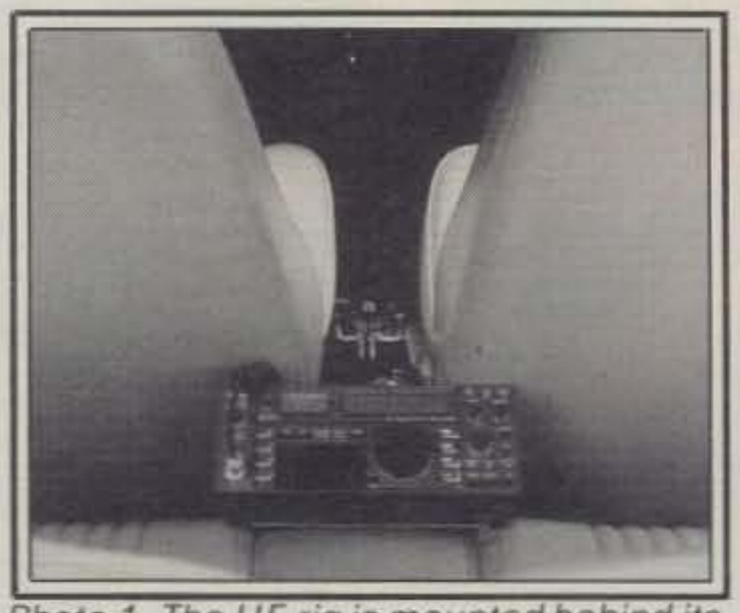

Photo 1. The HF rig is mounted behind its auto's front seats to provide maximum driver/rider room and, yes, convenience. Its dials are easily readable while driving, and it can be enjoyed from the rear seat.

Photo 2. New "barebones" van as purchased by W4CEC for customizing with amateur radio in mind. A single wooden stool graced the blank interior.

Photo 3. W4CEC's customized van upon completion. Unit sports dual power systems with external AC hookup plus full facilities for weekend living. It's deluxe throughout!

Customized Mobile Setups

As previously mentioned, a well-planned and smooth operating setup makes a decided difference in long-lasting mobile activities. Sometimes this equates to positioning a transceiver vertically between or against an auto's bucket seats rather than beyond arm's length under a dash. Other times it involves mounting an external speaker on a seat's back or where its sound reflects off a windshield's interior side. Every auto offers its own challenge, and the final installation obviously reflects personal preferences. Some of the newer autos have miniscule front-seat room, but a transceiver can be mounted behind the center console and viewed/tuned in an "over the right shoulder" manner. Since most mobile operations are within 30 or 40 kHz ranges, such brief tunings are quite convenient. (See Photo 1.) A nylon-type strap or K-Mart "bungie cord" can be used for both holding the rig steady and for providing quick removal when desired. Likewise, a light jacket can be thrown over the rig when leaving the auto unattended to deter thefts (a dark windbreaker can give the illusion of an empty interior).

Another mobile concept with special attraction involves mating an optional or homebrewed remote-control or external VFO with one of today's popular transceivers. Using this arrangement, the rig itself can be placed behind a front seat or located in the auto's trunk for security while its (remote) controls can be directly mounted in an auto's dash. The end results are maximum operating convenience and theft protection. Carrying that idea a step further, one might interface 2 meter and low-band SSB transceivers for total remote control via a handheld talkie. Assuming both rigs are equipped with VOX and single-frequency operation is acceptable, mere audio interconnections could complete the setup. Alternately, one might incorporate a full station interface such as Advanced Computer Controls "Shackmaster" to provide complete band tuning, mode selecting, gear on/off, etc., from a handheld talkie (check the Advertisers Index of *CQ* for A.C.C.'s info and address). Using the latter "remote mobile" technique, one could enjoy low-band DXing from some quite unique places—restaurants, movies, etc. Interesting, eh?

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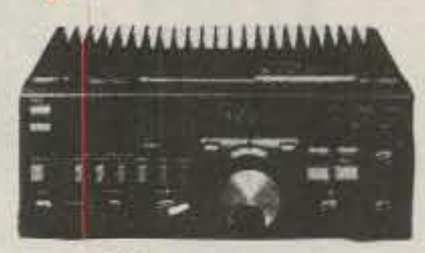

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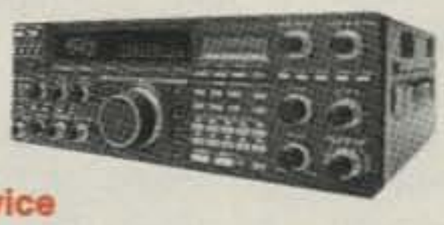

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Photo 4. Cockpit view of W4CEC's custom van. Almost any HF or VHF rig can be mounted on its operating desk. FM rig is mounted below desk top. All interior furniture is coordinated.

bilities for customized, attractive mobile setups. Consider, for example, W4CEC's "built from scratch" chariot show in photos 2, 3, and 4. A new van was purchased barebones, then fitted with movable windows, full carpets, leather panels, matching couch and captain's chairs, airplane-type dome lights, a collapsible rear table for a KW all-band setup, and a front cockpit operating shelf. The front shelf holds both low-band and VHF rigs, while the seats swivel for rear desk use and the couch opens into a queen-size bed. Regular mobile whips can be snap-changed on the van's mount and replaced with a base-loaded 16 foot vertical for fixed (overnight) multiband operation. All aspects considered, such "air-worthy" vehicles provide the ultimate in mobiling pleasures.

Mobile Operating Accessories

Some of the most often overlooked items in any mobile setup are operating aids and accessories. Although the occasional or casual mobiler might get by without these special touches, such continued activities may easily slip into a "more effort than enjoyment" category and result in an unnecessary decline of mobile interest. Strive to make mobile operations as convenient as fixed operations rather than depending on makeshift alternatives and you'll reap maximum returns from HF mobiling.

Trying to hear incoming signals in a noisy environment is the most common pitfall of mobile operations. A transceiver's internal speaker usually isn't properly positioned or physically large enough to handle those demands. An external sepaker can be placed in direct line with the operator's ear, and it can be volume-abused and/or replaced if later "cone rattling" is noticed. A *single* earphone of the button or in-ear style is also perfect for hearing weak signals, but remember safety and keep its volume low enough to hear ambient noises in the other ear. Regular transistor-radio earphones have deep notches or "holes" in their response. However, I've found the button-type stereo earphones' response equivalent to "speaker quality." They must be rewired and fitted with a monaural plug, however, for amateur use.

Rather than trying to remember calls and names while mobiling or jotting notes on business cards using a half writing pen, we heartily suggest using a note pad and wooden pencil. A secretary's steno pad is the ideal size; it doesn't cling to one's hand, and a pencil can be stored in its top spiral ring. The wooden pencil can stand extreme hot or cold, and it writes every time.

Additional mobile accessories worthy of auto inclusion are a hand key or key jack shorting plug and extra cables. Some transceivers require closing their key contacts for providing SWR-measuring full-carrier output, and traveling on a freeway 500 miles from home isn't the time to spot that deficiency. Extra coax cables are handy for adding occasionally needed items such as tuners or noise bridges. Extra power cables are a true blessing when minor rig problems develop and the unit must be serviced without the convenience of an AC supply. The keynote to all of these accessories is having them available in one's vehicle rather than their being at home when needed. Remember Murphy's Law and you can't go wrong.

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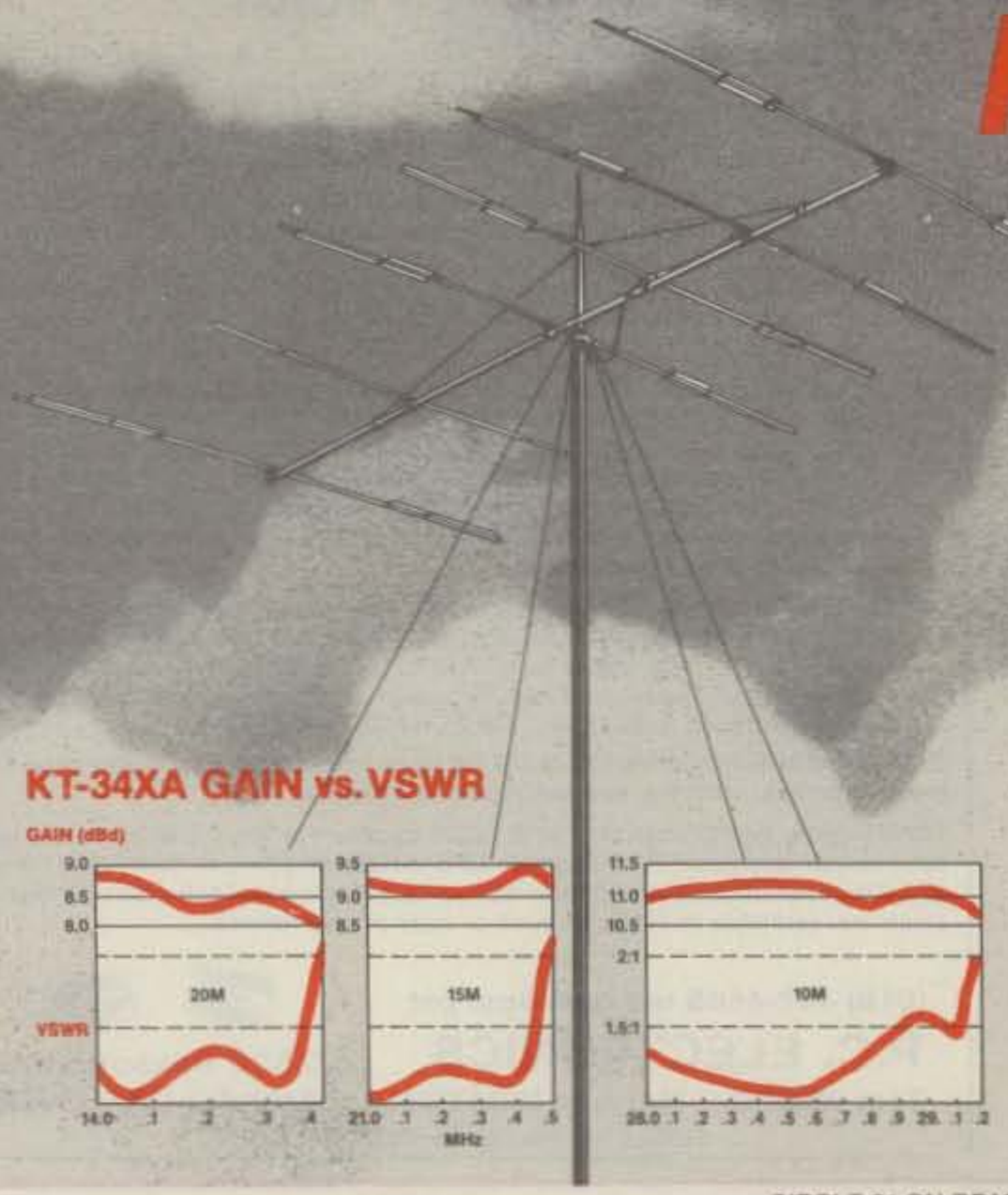

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and perform admirably. Today's popular whips such as Hustler, WinnTenna, and Ten-Tec can be assembled for use on any band, and frequency tuning is a breeze. Some doggone good mobile antennas can also be home constructed, and their designs are limited only by one's imagination. One example of those possibilities is N6MD, Robert Wilkinson's "pole vault dipole" shown in photo 5. The antenna is assembled around a 1⅝ inch by 18 foot fiberglass vaulting pole which is wound in a long helix (roughly 62 turns) using number 12 wire. Foam blocks support and insulate the pole while its ends are roped to the auto's bumpers and pulled tight enough to bend the pole. The antenna works 20 meters "as is," while end extensions of 6½ or 22 feet are added for (stationary) operation on 40 or 80 meters. I've QSOed N6MD on 20 meters, and his mobile vaulting signal is impressive.

Mounting a shiny new antenna fitted with top-quality coax onto an auto doesn't always ensure phenomenal returns. The "why" of that situation is a complete area of pursuit within itself. Sometimes an auto's frame isn't all one piece, bumpers can be insulated, and/or external impedance matching may be necessary. I've often found trunk lids and hoods insulated because their underside was paint-insulated from mounting brackets. Extra ground straps work wonders here. Use shield removed from RG8 and install with lockwashers, and then double-check everything using a very low resistance ohmmeter.

New model autos with electronic fuel injection can be a real headache to many amateur radio installations. If possible, try to check that situation before purchasing a new car (merely drive your old mobile setup beside the new car and check transmitted RF effects). The worst case I've found is the 1986 Plymouth; its motor absolutely dies when a 100 watt signal is nearby. I hesitate to visualize driving that auto admist a thunderstorm. The auto's microprocessor, sensors, and interconnections are not shielded. As of this writing, Chrysler Corp. hasn't been sympathetic or helpful. If that situation changes, we'll gladly report the results in subsequent columns.

Mobile CW

If you really want to experience amateur radio supreme, we heartily suggest giving Morse Mobile a good old college try. The convenience of using a seat-strapped or leg-clamped key rather than an attention-grabbing mike must be experienced to be fully appreciated. (See photo 6.) In fact, our April 1984 World of Ideas column was specifically dedicated to mobile CW. Since we haven't space for repeating that information here, we urge your reviewing that column.

Mobile CW can prove to be both fun and signal advantageous in several ways.

Photo 5. N6MD's pole-vault dipole works 20 meters as shown; extensions are added for (nonmoving) 40 or 80 meter operation. The complete lashup (no pun intended) can be removed in five minutes. Antenna performs admirably.

The refreshing enjoyment of non-vocal QSOs is complemented by somewhat higher signal field strengths (the benefits of CW over SSB at barefoot levels, for example), and DX capabilities are noticeably improved when using Morse. The most important points to consider, however, are operating convenience and flexibility. Electronic keyers with smooth-handling paddles and external memory units truly prove their worth when used mobile. Don't just take our word for those statements; try it and see for yourself.

Conclusion

Although VHF and FM may still be in vogue, HF mobile operations reign supreme in service and enjoyment. As I've pointed out, the main key to that pursuit is converting the mobiling experience to mate with one's lifestyle. If going mobile means disconnecting the home rig, moving it to the auto's mount, probing under the seat for cables, going back to the shack for mike and key, improvising with a pen and scrounging scratch paper, then reversing the procedure after returning home, it's all more trouble than it's worth. Line up everything for one-step mobiling and enjoy the results.

If you're considering the purchase of a new auto, keep in mind some of the previous ideas. We all know amateurs tend to buy homes with amateur radio capabilities in mind, so why settle for less in an auto. We also suggest RF-checking 1986 model autos before plunking down cash for a non-RF-proofed vehicle. Good luck, and we wish you good mobile DXing.

73, Dave, K4TWJ

Photo 6. Here's the latest jewel for HF mobiling in style: Hi Mound's MK707 mobile squeeze paddle. It's dust protected, and has a non-skid rubber bottom and stainless spring leg clamps which swing in a circle or lay flat for table use. It's available from Skywave Radio Systems, 943 Boblett, Blaine, WA 98230.

Novice

a monthly feature by
BILL WELSH, W6DDB

"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

Yasme Foundation and The Colvins

I have received requests from new amateurs for information about the Yasme Foundation. Such requests usually come from new amateurs who have recently contacted a DX (foreign) station and have been told to "QSL via Yasme," which usually leaves a new amateur very confused. The information in this article was supplied by Lloyd Colvin, W6KG, with whom I chatted during a YL convention in Las Vegas. Fortunately, both of our wives were delayed more than an hour in getting out of the meeting they attended, which was to my advantage. The aid of Bob Vallio, W6RGG, has also been appreciated; Bob is Secretary of the Yasme Foundation.

History

During 1954 British subject Danny Weil built a yacht and named it "Yasme," using a Japanese word that means "good luck." He had never sailed a boat before and he was not an amateur radio operator, but he was determined to sail around the world. Despite the great difficulties he encountered, Danny managed to sail the Yasme from England to the British Virgin Islands, where he was fortunate to meet Dick Spenceley, KV4AA, one of the world's best operators. Dick convinced Danny to become an amateur before continuing his trip around the world. Danny earned a license and was working DX (foreign stations) on code at 20 wpm one month later. He installed a rig aboard the Yasme and continued his trip, calling it the Yasme DXpedition. The Yasme Foundation was formed during 1961 to help Danny meet DXpedition expenses. The Yasme Foundation is tax free.

Danny got married in 1964, and his wife accompanied him on several trips before they settled ashore. Since 1965 the Yasme Foundation has sponsored DXpeditions of Iris, W6QL and Lloyd, W6KG, Colvin, two of the world's most competent operators, with the Colvins paying all of their own expenses. The Yasme Foundation handles QSL cards and DXpedition publicity.

Iris and Lloyd Colvin

Lloyd, W6KG, has been licensed since 1929, and Iris, W6QL, has been licensed since 1945, which makes a combined total of 98 years. Their daughter, Joy, is also an amateur. Many amateurs feel that they have achieved a major operating milestone when they get their DXCC award for confirmed contacts with amateurs in at least 100 countries. Such operators have just cause to be proud, because the DXCC award is not easy to earn. However, the Colvins have earned DXCC awards while using about 100 different call signs all around the world. This couple holds more DXCC certificates than any other couple in the world. The Colvins have made over one million contacts from 166 countries, and they have used 120 different call signs. They have the world's largest alphabetically filed collection of QSL cards, numbering about 500,000 cards.

A recent photo of Lloyd, W6KG, and Iris, W6QL, Colvin at their home QTH in Richmond, California.

The Colvins are Extra class licensees. They both hold 5-band DXCC awards, and they have been on the ARRL DX Honor Roll for more than a decade. They were well know as top operators long before they became associated with the Yasme Foundation. Following the end of WW II, Lloyd stayed in the U.S. Army Signal Corps, spending 20 years completing worldwide assignments that enabled Iris and Lloyd to operate from many countries.

Latest Yasme Dxpedition

The Colvins are now on another DXpedition that is expected to last from October 1985 to April 1986. They hope to operate from nine or ten African countries, working equal amounts of code and voice contacts. As usual, amateurs will be listening for them and working them from as many countries as possible.

Yasme QSL

If you are told to "QSL via Yasme," send your card to the Yasme Foundation, P.O. Box 2025, Castro Valley, CA 94546. Be sure to include your self-addressed, stamped envelope (SASE) to assure the quickest reply to your QSL request. All Yasme contacts are QSLed soon after they are verified in the logs. I can personally vouch for the accuracy of the preceding statement, as I have received many Yasme DXpedition cards.

Getting Started

I receive several almost identical letters each year. They are from General (or higher) class licensees who want others to know about their experiences as Novices. The following comments and advice are common to most of these letters:

(1) If possible, attend a formal Novice licensing course.

(a) Such courses are known to sales personnel working for local radio/electronics outlets.

(b) Course data can be obtained from the American Radio Relay League, Clubs and Training Department, 225 Main Street, Newington, CT 06111. Tell them your postal zip number, plus the zip numbers of your nearby towns and cities.

(c) Ask any amateur for course information. Many amateurs display their call signs on their clothing, vehicles, and elsewhere.

(2) Whether attending a formal course or studying alone, establish a reasonable study period and stick to it.

(3) Code considerations are as follows:

(a) Code practice should precede study of the written material in each session, and it should not exceed 45 minutes per session.

(b) Transmitted code symbols should only be referred to as dits and dahs; there are no dots and dashes in the symbol sounds.

(c) During the initial learning phase, it helps to sound out road signs and advertisements in dits and dahs. If alone, do this aloud; if in an area where you are surrounded by strangers, it is usually advisable to do this without uttering noises that make people think you belong in a booby hatch.

(d) Sending checks can be self-ob-

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Say You Saw It In CQ

This is nine-year old James E. Cannon, KA5TTQ, of Gonzales, Louisiana. He attended a Novice licensing course conducted by the Ascension Amateur Radio Club, and he received his Novice license one month before his eighth birthday. His first contact was with WA6HEG, who provided his first QSL card. James is an honor-roll student in Gonzales Primary School, where he is in the fourth grade. His father is Joseph Cannon, KA5RNH.

tained by taping an article cut from a newspaper or magazine. Set aside the cassette seven to ten days before copying its contents. Listen to the recording a second time through to make certain you copied everything exactly as it is taped. Your critical appraisal of the taped item will enable you to detect sending faults. Two to four tapes should be recorded each week during the first month of practice, with each sending session 15 to 20 minutes long.

(e) Code receiving practice should be limited to less than 45 minutes per practice session, with 30 minutes being the preferred practice time. Code receiving practice sessions should be held every day during the first month of practice, and no less than four days per week until one's proficiency reaches seven words per minute (wpm).

(f) The best way to increase code receiving proficiency past seven wpm is to operate on the air. Get your Novice license and set up your initial station as soon as possible. This enables you to shift from the "work" of code practice to the "fun" of operating.

(4) Theory and rules considerations are as follows:

(a) Make certain you are using a study guide that reflects the current material. FCC Element Two (Novice) material is presently scheduled to be updated during January of each year.

(b) A copy of the ARRL FCC Rules book makes it easier to understand the examination questions about FCC rules and regulations. It is easier to learn this material than it is to memorize it. Also, it helps one to know the rules.

(c) Properly proportioned typical final exams allow students to determine whether or not they are ready to take the FCC Novice test at the conclusion of a course. Sample exams show the student subjects that require further study before they attempt the FCC test.

(d) Exposure to actual parts helps one understand them better. An assortment of capacitors, resistors, inductors, transformers, transistors, tubes and other component parts provides "hand on" familiarity.

(e) Public libraries contain electronic and communication textbooks that can be used to supplement the study guide used in one's licensing course.

(f) A dictionary of electronic terms is an excellent book to help the newcomer become familiar with unknown terms.

(5) As soon as you are able to do so, pass the FCC Novice examination.

(6) As soon as you have passed the Novice test, get your initial station assembled.

(a) Get the best equipment and accessories that your financial situation allows you to purchase. Do not get junk equipment, because newcomers have too much trouble obtaining good operating results when using poor gear.

(b) Install a good ground system and the best possible antenna system.

(c) Set up your station in a comfortable part of your home; use an area that is heated and/or cooled, as required.

(d) Do not overload a wall receptacle by drawing too much power from it. If possible, use a lightly loaded (or separate) line. Do not use higher rated fuses when correct ones open (blow).

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RS-20A, RS-20M, RS-20S, VS-20M	16	20	5 × 9 × 10½	18
RS-12A, RS-12M, RS-12S	9	12	4½ × 8 × 9	13
RS-10A	7.5	11	4 × 7½ × 10¼	11
RS-7A, RS-7B	5	7	3¾ × 6½ × 9 4 × 7½ × 10¾	9
RS-4A	3	4	3¼ × 6½ × 9	5

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(e) Set up the station on a desk or table that provides adequate operating space. It is important to be comfortable when one is operating.

(f) Make sure that station lighting is good. Avoid fluorscent lamps, dimmers, and other things that can cause noise that interferes with received signals.

(7) Operating considerations.

(a) Be an operator, not just a license holder. Get on the air and have fun operating; it is a continuation of the learning process new amateurs should complete.

(b) Establish a reasonable operating schedule, and stick with it until your code receiving speed reaches about 15 wpm. One to three contacts per day, four to seven days per week should enable one to attain this proficiency within three months. However, one should not be overly concerned about reaching this code proficiency, since one has to prepare to pass the written Technician/General (FCC Element 3) test to upgrade. It is advisable to apply for the General license, even if one's code speed is marginal for passing 13 wpm. If one flunks the 13 wpm (FCC Element 1B) code test, one is still eligible to take the Technician written test at the same VEC session. Many amateurs upgrade in steps, starting at the Novice license and progressing through the Extra class license.

(c) Get a reasonable quantity of QSL (confirmation) cards, which is at least 500. One has to send cards to get them. Exchanging QSL cards is a fun aspect of amateur radio. Cards received as a Novice still count towards operating awards after one upgrades, even if the call sign is changed.

(d) Send a few self-addressed stamped envelopes (SASE's) to the ARRL Incoming DX QSL Bureau serving your call-sign district, as shown in *QST*.

(e) Try the bands at times when they can be expected to be open to distant points. Try 10 meters during the morning and early afternoon. Ten meters is not very useful at this low point in the sunspot cycle, but it is sometimes open to the world. When 10 is closed but you want to do some daytime operating, get on 15 meters. The 15 meter band is usually open to some parts of the world during portions of each day. During evening and night hours the Novice 40 and 80 meter bands provide the best long-range communications opportunities. The 80 meter band has less interference than 40 meters; however, 80 meter antennas are too long for many amateurs to erect at their homes.

(f) Be courteous on the air. Avoid unnecessary interference. Do not compound a bad situation by participating in any improper operation you might encounter.

The preceding comments reflect the contents of approximately a dozen letters I have received during the past year regarding this general subject. These ex-Novices did not state anything that has not been covered in previous Novice columns. However, the uniformity of their comments made them worth repeating. If you want a list of the subjects that have been covered in detail in previous Novice columns I wrote, request it and furnish an SASE; please use my California address, which is shown on the first page of each Novice column. The list is divided into the six general categories that are studied herein, with the number of items within each category shown beside each heading:

Introductory Information, 13
Code Information, 6
Theory Information, 9
Miscellaneous Information, 5
Station Information, 9
Operating Information, 26

Photographs Wanted

Photographs of Novices in their shacks provide introductions to a few of the newer amateurs. Photograph size in unimportant, but good definition, contrast, and subject matter are important. Color pictures can be used, but black-and-white photographs are preferred. Operating activities and achievements, plus a self-introduction, are needed with each picture. Send an SASE if a picture must be returned. A free one-year *CQ* subscription or renewal is awarded to the one amateur whose picture I select as the winner for the month. If you are a subscriber, enclose the mailing label (or copy) from your latest *CQ* issue. One award is made each month, no matter how many photographs are printed. DX amateurs who frequently work the American Novice bands are also urged to submit photographs. I have never received pictures from Novices in Hawaii or Vermont.

76, Bill, W6DDB

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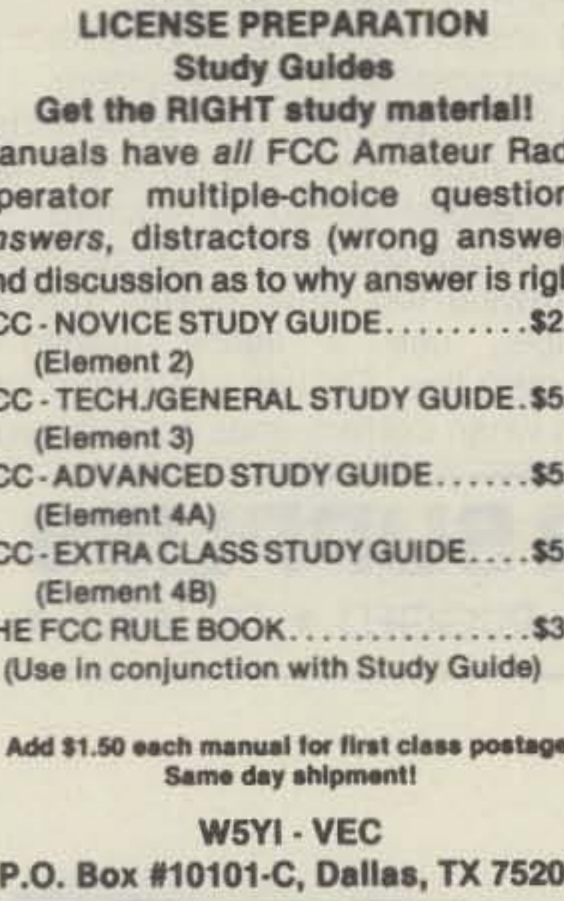

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THE INS AND OUTS OF THE WASHINGTON SCENE

Hearings on Communications Privacy Postponed Until Early 1986

Given the last-minute gyrations on the budget deficit and tax reform, there simply was not time for the Congress to consider the Electronic Communications Privacy Act of 1985 (H.R. 3378 and S. 1667) before that body adjourned for the holidays. The House, in particular, postponed hearings on H.R. 3378 until early in the next session (as we go to press, these hearings were scheduled for late January or early February 1986). Thus, by the time this is read, the ARRL should have testified before the Subcommittee on Courts, Civil Liberties and the Administration of Justice, House Committee on the Judiciary. Speaking for the League will have been Washington Area Coordinator Perry Williams, W1UED, who will have used material developed by League Counsel Chris Imlay, N3AKD.

During the close of 1985, and as the subcommittee was preparing for its hearings, there was considerable talk in Washington and elsewhere to the effect that the cellular telephone industry was at war with the Amateur service. In particular, that industry was cited as wanting to bring amateur phone patches under the proposed provisions of the Privacy Act. Further digging suggests that the subcommittee staff—not the cellular telephone industry—was behind such a move. (One Judiciary Committee staff member, for example, was given a demonstration of amateur phone patches using an HT, and was appalled that the party who answered the telephone did not know she was on the air).

Given what has transpired to date, it is clear that the Amateur service must now move to have both the House and Senate bills amended so as to make clear the fact that the Privacy Act in no way regulates amateur communications.

Electronic Industry Finally Moves On RFI Standards

For years, the number of RFI complaints to the Commission has run into the tens of thousands each year, with television receivers reported as the victim device in over 75 percent of all cases reported. And now, with VCRs the most popular electronic home entertainment device on the market, RFI cases involving these products are skyrocketing. It is against this backdrop that the electronics industry has finally moved to set voluntary RFI standards for TVs and VCRs.

Specifically, Committee C-63 of the American National Standards Institute (ANSI) has completed its work on RFI standards for television receivers and video cassette recorders, and has forwarded its recommendations to Chairman Dr. Robert Showers for review. Participating in the work of the ad hoc committee were organizations such as the Electronics Industries Association (EIA), the Institute of Electrical and Electronics Engineers (IEEE), the Federal Communications Commission (represented by Frank Rose, W3OWU), and the ARRL RFI Task Group (represented by Hugh Turnbull, W3ABC). The recommendations, according to one source, take cognizance of the fact that for fixes to be most effective, they must be applied at the time of manufacture . . . not after the fact, in the field.

The development of voluntary standards by Committee C-63 comes over ten years after Vic Clark (W4KFC; now a Silent Key) and your Washington Editor (Co-Founders, and Chairman and Secretary, respectively, of the ARRL RFI Task Group) first introduced the problem of RFI to electronic home entertainment equipment into the committee. However, without the enabling legislation on RFI recently passed by the Congress (i.e., "The Goldwater Bill), there was no "stick" to move the electronics industry into action. Even with such legislation, the Commission's move towards "unregulation" under the Reagan Administration has fostered an attitude that voluntary standards are preferred to legislated standards. Apparently, the increasing number of RFI complaints involving the video cassette recorders that are now flooding into the market has finally forced both the Commission and the electronics industry to act!

Pest-Control Devices May Cause RFI

If you live near a restaurant or some other establishment where mice, rats, and roaches are a problem, ultrasonic pest-control devices could be causing your RFI problems. Tests at the FCC Laboratory indicate that some of these devices produce interference in the band 20 to 470 MHz—just the place, for example, to disrupt amateur and land mobile communications as well as television viewing.

The pest-control devices, of course, are subject to the incidental radiation provisions of Section 18 of the Commission's Rules. So, if such a unit is found to be the source of interference to your operations, contact the Field Operations Bureau, FCC, Washington, DC 20554, with your complaint.

Private Radio Bureau Faces Busy Year

As this is written, the government, for all intents and purposes, is shut down for the holidays. But by early January, according to John Johnston, W3BE, Special Services Division, Private Radio Bureau (PRB), the FCC should have released decisions on the following issues:

- Microwave Access (PR Doc. 85-23)
- Automatic Control of Amateur Stations (PR Doc. 85-105)
- 40 Meter Phone Expansion in the Caribbean (PR Doc. 85-104)

With these matters out of the way, the PRB will attack a mounting pile of paperwork that has accumulated over the last several months:

- The so-called "Broadcasting Docket" (BC Doc. 79-47), for which responsibility has been shifted to the PRB. The problem here involves defining what constitutes an "emergency" as that term pertains to the use of stations in the Amateur service.)
- Repeater Coordination (PR Doc. 85-22)
- F-2 Emission of 29.5 MHz (PR Doc. 85-168)
- Remote Control of Aux Link Stations (PR Doc. 85-215)

In addition to the dockets noted above, the Bureau will continue its work on a number of rulemaking items:

- Exam Credit for Portions Passed (RM 4991)
- Public Digital Service (RM 5241; this item involves the creation of a new radio

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service, outside of the Amateur service, and intended for use by computer/digital experimenters. No demonstration of code proficiency would be required to obtain a license, and it has been proposed that operations be conducted at the top end of what is now the amateur 6 meter band.)

• Expanded Novice Privileges (RMs 5022-2025, RM 5038)

Finally, the PRB is expected to issue a ruling in the matter of PRB-2 (involving use of the amateur 434 MHz band for remote video links by a cable operator in Arizona).

Truly, it will be a busy—and interesting—year for both the Commission and U.S. amateurs!

Condominium Developer Addresses Antenna Problem For Amateurs

H. Ellis Saxton is a ham—W4QED. He is also a condominium developer on the east coast of Florida, and he wanted amateurs residing in his developments to be able to enjoy their hobby. Thus, even before the Commission's pronouncement on PRB-1, Saxton had his attorney develop a clause for his corporation's contracts that addressed "Exterior Appearance" as it pertained to the installation of amateur antennas. It also provides a mechanism for the ultimate disposition of a problem over antennas in the event that no voluntary agreement can be reached.

Readers interested in learning more about the "QED Clause" should contact Saxton at the following address: Melbourne Properties Ltd., Attn: H. Ellis Saxton, W4QED, P.O. Box 2528, Melbourne, FL 32902-2528. Don't forget to include an SASE with 39 cents postage.

1986 Handbook For The Radio Amateur A Blockbuster

Building on the success of its *1985 Handbook*, the ARRL has released a 1986 edition that, among other things, contains 27 new construction projects. This year's *Handbook*, which is 2 inches thick (that's over 700 pages of text!), is divided into 6 major sections: Introduction (5 chapters), Radio Principles (12 chapters), Modulation Methods (4 chapters), Transmission (2 chapters), Construction and Maintenance (12 chapters), and On The Air (5 chapters). Several sections, in particular, came in for major rewrites, including the chapters Digital Basics, Digital Communications, and Special Modulation Techniques. And the 500 new or revised figures make this *Handbook* one of the easiest ever to read and understand.

While it is not possible to cover the contents of the volume in detail, suffice it to say here that the material on basic communications/electronics still provides one of the best treatments you can find on these subjects. Add to that hefty sections on packet radio (Chapter 19), spread spectrum (Chapter 21), satellites (Chapter 23), and other "hi-tech" subjects, and you'll rapidly conclude that if it's amateur radio, it's in *The ARRL 1986 Handbook for the Radio Amateur*.

For more information on the *Handbook*, contact your local retailer or the ARRL, Newington, CT.

Inexpensive Introduction To Packet Radio Described

Packet radio is coming on strong! And if you ever had a desire to join the fun, Bob Bruniga, WA4APR, has a suggestion. Writing in a recent issue of *AMRAD Newsletter* (the journal of the Amateur Radio Research and Development Corporation), Bruniga suggests that you consider using a Brother Model EP44 as the basis for your system. This battery-powered portable typewriter, which has recently fallen to under $100, has full editing and memory printing capabilities as well as a built-in RS-232 port. Thus, by coupling the device with a TAPR TNC-II, for example, you can easily produce a printing porta-packet terminal for field and emergency communications.

For more information on converting the EP44 to packet radio, including the plans for an EP44 aluminum bottom plate to hold the TNC, contact: Robert Bruniga, WB4APR, 59 Southgate Avenue, Annapolis, MD 21401.

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Awards

a monthly feature by
DOROTHY H. JOHNSON, WB9RCY

NEWS OF CERTIFICATE AND AWARD COLLECTING

The Story of the Month told by Fred is:

Col. Fred F. Seifert, W5FS
All Counties #215, 2-12-79

"I arrived on this earth in Milwaukee, Wisconsin in 1912, a bit too late to witness the birth of radio, but soon enough to observe some if its younger years. In 1920, at the age of 8, I put together my first receiver, a crystal set with a coil wound on an empty oatmeal box. Rectification of the incoming RF signal was accomplished by use of a galena (lead sulphide) crystal detector, to provide an audio signal to a pair of headphones. Since all of the energy came from the field of the broadcast station, the range of such a receiver was very limited.

"This limited range stimulated a desire for something better, and the next project was a one-tube regenerative receiver with a type WD 11 vacuum tube, powered by ½ and 22 ½ volt dry-cell batteries for filament and plate, respectively. The parts were purchased at a local 'five and dime' store, which in those days carried a good stock of radio components. This opened the new world of broadcast station DX, and many a late night was spent listening to far-off stations such as KFI in Los Angeles, WEAF in New York, and when reception was good on a winter night, PWX in Havana, Cuba.

"With increased public interest in broadcast listening, commercial receivers became readily available, produced by pioneer companies such as Grebe, Atwater Kent, Crosley, and Kodel. My family chose one of the latter firm's products, a five-tube tuned radio frequency (TRF) receiver. They had not yet learned how to make three variable condensers track, so there were three dials to tune. Although the upper limit of the broadcast band was 1500 kc, this receiver's range extended a bit beyond that, and at the top of the dial I was intrigued to discover stations with strange call signs conversing with one another. I had stumbled onto the 160 meter band, and this was my first real introduction to ham radio. Listening was fun, but I would not be satisfied until I could join in the activities with a station of my own.

"A fellow employ of my father's, who was a ham, learned of my interest and loaned me some literature on amateur radio and an 'Omnigraph' code practice machine. I also discovered the local Milwaukee Radio Amateurs Club, and with some help from the members and an

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Col. Fred F. Seifert, W5FS, USA-CA All Counties #215, 2-12-79.

Fred, W5FS (ex: W9EFX) circa 1930, in Milwaukee, Wisconsin.

ARRL Handbook (first edition), I soon mastered the code and enough theory to pass the exam. On May 14, 1929 I received my first ham ticket with the call letters W9EFX. Actually, there were two licenses, a station license issued by the Federal Radio Commission and an operator's license issued by the Department of Commerce, Radio Division.

"Had there been any county hunters at that time, they would have found it next to impossible to 'work them all.' FRC General Order 84 stated 'For the present amateur mobile stations will not be licensed.' Portable operation was possible but difficult. It was necessary for one to give advance notification of the time and place of each such operation to the supervisor of radio for the district in which one was licensed.

"My first transmitter was a type 210 tube in a Hartley circuit, a self-excited oscillator with about 25 watts input. One of the criterion of maximum input was when the plate glowed a cherry red! The radiating system was an antenna and counterpoise, their length determined by the available distance between our house and an adjacent building. The receiver was a regenerative detector with two stages of audio amplification, enough to drive a horn loudspeaker. All of the receiver tubes were type 201A, the workhorse of that period. In those days before crystal control took over, one did not worry about the precise frequency of transmission, the only concern being to stay within the band limits. Strong commercial stations just outside the amateur bands were used as markers. I recall one such station, WIZ, just below the 40 meter band, readily identified because when it wasn't handling traffic, which seemed to be most of the time, it sent continuously 'VVV de WIZ ZHC' (ZHC is the commercial equivalent of QTC).

"Shortly after my license arrived, I was on the air with 40 meter CW. My first contact was with a station in Seneca, Kansas, W9GFO, and I still have the QSL card he sent me for that QSO.

Fred, W5FS, walking away with his prize from the County Hunters Convention in San Diego, CA, July 1982. The prize was a Kenwood TS-430 transceiver. (Photo by W2PDM)

"Between 1930 and 1934 I attended the University of Wisconsin in Madison, earning a BS degree in Electrical Engineering. While there, I picked up an additional station call, W9ETK. Several of my classmates worked nights on the toil testboard of A.T.&T. in the Madison telephone exchange, and I would often visit them in the evening to study and do work on our school assignments. Some of the company business was carried on over Morse telegraph lines, and being there with the Morse sounders clacking around me, by some sort of mental osmosis I learned the American Morse code. There were quite a few hams along the lines at other A.T.&T. offices, and at times when activity was dull one could have a QSO with one or more of them using either

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W4RKV	598	W4RKV	903	JA1QXY	2071
		N6ATS	904	CT1UW	2072
		WDØEQA	905	AC3T	2073
2000		KJ4EJ	906	6Y5DA	2074
W4RKV	655	6Y5DA	907	AH6CG	2075

County Hunters conferring at the convention in Manchester, TN. Shown are John, N8BGF, Doug, KD9Q, and Les, N9ATA.

American or Continental Morse or a combination of the two.

"Because the Great Depression of 1929 was holding firm, the class of 1934 found few employers seeking their services. I was fortunate enough to obtain employment with a gas public utility, where I could use at least some of my education in drafting and making electrolysis studies. However, the pay was low and the future dubious, so when the U.S. Civil Service Commission announced an examination for Radio Engineers, I promptly applied. After passing the examination, I was offered a position at the Aircraft Radio Laboratory at Wright Field in Dayton, Ohio, an offer I promptly accepted.

"The laboratory was operated by the Signal Corps for the Air Corps and was engaged in research and development of all forms of radio equipment for use aboard military aircraft and associated ground equipment. I was assigned to the Radar Branch, where I played a small role in helping radar grow from crude VHF gear to more exotic 10 cm and 3 cm band equipment. While there I traded W9EFX for W8WWA.

"At the University of Wisconsin I had taken ROTC training and upon graduation received a commission as Second Lieutenant in the United States Army Signal Corps Reserve. At Wright Field I was offered a chance to go on active duty as a First Lieutenant and I accepted. Rather than bore my readers with war stories, I will skip the WW II years and pick up with amateur radio activity, which was resumed at the end of the war.

"Although I had started my military career as a Signal Corps officer, I served in that capacity only a couple of years, after which I was transferred to the Air Corps. When the United States Air Force became a separate service, I transferred to it. At the end of World War II I was stationed at Fort Monmouth, New Jersey, serving as the Air Force representative at an electronic components standardization activity. As soon after the war as amateur radio operators were permitted to get back on the air, I exchanged my W8WWA call for W2RVU. With surplus military equipment available at give-away prices in the surplus radio shops of the Cortlandt Street area in lower Manhattan, I acquired a BC-610 transmitter and BC-224 receiver, and soon I was working the world. I even had a contact with mainland China, a rare country then and even more so shortly thereafter when amateur radio in the country was banned. Until I left there, I did not fully appreciate the great DX advantage of an East Coast location near the ocean.

"The remainder of my military career involved the usual periodic changes of station in the USA, Europe, and the Pacific. Calls held during that time included W5QJO, K6CDD, W4JTV, and W5MHQ. Except for military club stations, the only place I was able to get on the air from a DX location was when I was stationed at Hickam Air Force Base in Hawaii, where I operated as W4JTV/KH6.

"About ten years ago I came across the county hunter activity on 14.336 MHz, joined the Mobile Amateur Radio Awards Club, and began to collect counties. By this time I had retired from the USAF and, having spent four years of military duty in Albuquerque, New Mexico (Bernalillo County), decided to make it my permanent home. My wife, Gladys, helped make this decision, as both of us enjoy the dry climate of this high semi-arid country. We had seen enough ice and snow in our early years in Wisconsin and wanted no more if it. While our 5300 foot elevation gives us some cold nights in the winter, the abundant sunshine makes for comfortable days. At least I was able to put together a ham station without having to consider how I could quickly tear it down for the next move.

"Although I had worked many counties with my previous calls, I decided to start all over and work them all as W5FS. I also put a mobile rig in the car so I could give as well as receive. In retrospect, I think I have enjoyed giving out counties much more than collecting them. I worked my last county on 13 January 1979 when Dennis, WB5KEA, gave me a contact from Frontier County, Nebraska. However, I still had an outstanding confirmation for Webster County, Nebraska. Despite letters and telephone calls to the amateur who had given me that county, I

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PL259	10/4.95	2N6084	11.95
PL258	10/7.95	UG175/176	10/1.55
M358	2.25	UG255/U	1.55
813	29.00	UG273	2.20

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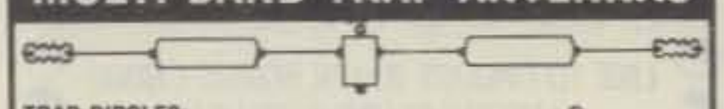
CIRCLE 121 ON READER SERVICE CARD

MULTI BAND TRAP ANTENNAS



TRAP DIPOLES:

Model	Bands	Traps	Length	Price
D-42	10/15/20/40	2	55'	$59.95
D-52	10/15/20/40/80	2	105'	64.95
D-56	10/15/20/40/80	6	99'	109.95

TRAP VERTICALS - "SLOPERS":*

VS-31	10/15/20	1	12'	42.95
VS-41	10/15/20/40	1	21'	44.95
VS-52	10/15/20/40/80	2	52'	59.95
VS-53	10/15/20/40/80	3	49'	69.95

*Can be used without radials
*Feed line can be buried if desired
*Permanent or Portable Use

ALL ANTENNAS are Ready to use - Factory assembled - Commercial Quality - Handle full power - Comes complete with: Deluxe Traps, Deluxe center connector, 14 ga Stranded CopperWeld ant. wire and End Insulators. Automatic Band Switching - Tuner usually never required - For all transmitters, Receivers & Transceivers - For all class amateurs -One feedline works all bands - Instructions included - 10 day trial!

COAX CABLE: (includes PL-259 connector on each end)

Type	Length	With antenna purchase	Separately
RG-58	50'	$8.00	$11.95
RG-58	90'	12.00	16.95

DELUXE CENTER CONNECTOR

- ★ NO RUST Brass Terminals
- ★ NO jumper wires used
- ★ NO Soldering
- ★ Built in Lightning Arrestor
- ★ With SO-239 Receptacle
- ★ Handles Full Power
- ★ Completely sealed, weatherproof
- ★ Easy element adjustments
- ★ Commercial quality

CE-1
$8.95

DELUXE ANTENNA TRAPS: Completely sealed & weatherproof - Solid brass terminals - Handles Full power -NO jumpers - NO Soldering Instructions included.
For 4 band Dipole Ant. 40/20/15/10 $36.00/pr.
For 5 band Dipole Ant. 80/40/20/15/10 $38.00/pr.

ORDER DIRECT FROM FACTORY: *All orders shipped US Postpaid*
VISA/MC - give card #, Exp. date, Signature

VISA

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Hendersonville, NC 28793

Dealer Inquiries Invited

CIRCLE 165 ON READER SERVICE CARD

was unable to get the required card, and a rework was in order. In desperation I telephoned Randy, W0DSY, for help. Randy was down with a bad cold, but volunteered to drive the 50 or so miles to Webster County, and within an hour I had the county worked. I received USA-CA All Counties #215 dated 12 February 1979.

"It would take several pages to acknowledge all who contributed to my quest. However, special thanks must go to Mel, W5AWT, who made several long trips in West Texas, and especially in the Panhandle area, to help me finish that state. Of course, without Karl, WA6MAR, the late Ben, K1UNM, and other net controls, it would have been extremely difficult to have worked them all.

"My current amateur radio activity consists mainly of working DX and trying for some of the more challenging DX awards. The present station consists of a TS-430, Alpha 78 linear, and two-element quad and dipole antennas. County hunting has brought me many new friends, and to keep in touch I attend the National County Hunters Conventions and some of the Mini Conventions every year. I keep an ICOM 730 transceiver and antennas in the trunk of my car, and whenever we are away from home, I try to run a few counties on SSB or CW. After 56 years of ham radio, I still think it is a great hobby!

73 de Fred, W5FS"

(Note: Fred failed to mention that, in addition to all of his other activities he is a well-know philatelist. For many years he was editor of the British Caribbean Philatelic Journal, *published by the British Caribbean Philatelic Study Group.—ed)*

Awards Issued

Mitch Clemons, W4RKV, finished all the paperwork and claimed USA-CA 500 #2068, USA-CA 1000 #903, USA-CA 1500 #732, USA-CA 2000 #655, USA-CA 2500 #598, USA-CA 3000 #533, and All Counties #501. All awards are dated 11-8-85 and endorsed All Mobile, All SSB.

Mark A. Stidam, AI9Y, sent for the gold seal for USA-CA 3000 #534, 11-20-85, Mixed.

Phillip R. Pritchett, N6ATS, qualified for USA-CA 500 #2069, USA-CA 1000 #904, and USA-CA 1500 #733, 11-8-85, All SSB.

David C. Weitzel, WD0EQA, took time out from his duties as City Manager of Sidney, Nebraska to send for USA-CA 500 #2070 and USA-CA 1000 #905, 11-9-85, Mixed.

Clarence Willis, Jr., KJ4EJ, qualified for USA-CA 1000 #906, endorsed All SSB, All 20 Meter Mobile, 11-12-85.

Donald C. Ashdown, 6Y5DA, claimed USA-CA 500 #2074 and USA-CA 1000 #907, 12-2-85, Mixed.

USA-CA 500 certificates went to:

Karl Breitenbach, DF5DR, 11-7-85, All CW.

Mitch Clemons, W4RKV, 11-8-85, All Mobile, All SSB.

Phillip R. Pritchett, N6ATS, 11-8-85, All SSB.

David C. Weitzel, WD0EQA, #2070, 11-9-85, Mixed.

Tsuyashi Hanazaki, JA1QXY, #2071, 11-14-85, Mixed.

Joao Antonio Da Silvo Paulo, CT4UW, #2072, 11-18-85, All SSB.

Len Moncaleri, AC3T, #2073, All SSB, 11-25-85.

Donald C. Ashdown, 6Y5DA, #2074, 12-2-85, Mixed.

Clarence A. Gardner, AK6CG, #2075, 11-8-85, Mixed. *(Note: This award is dated out of sequence through error. —ed.)*

Awards Available

Trondheim DX Award. The Trondheim DX Club of Norway offers the Trondheim DX Award for working at least five amateur radio stations in the Trondheim area. Send your certified list of log excerpts, plus QSL cards for stations worked (if you have not previously sent them to those stations) to: Trondheim DX Club, P.O. Box 292, N-7001 Trondheim, Norway. There is no fee for this award, but return postage would be appreciated (i.e., 5 IRC's).

Isle of Wight Radio Society Award. This award is available to any licensed amateur who has had two-way contacts with at least five different stations on the Isle of Wight. To apply for this award send a certified log extract with a fee of $3.00, or 10 IRC's, to E. Westmore, G3RXC, 10 Alvington Road, Carisbrooke, Newport, Isle of Wight P030 5AR, England.

Jersey Island Award. Jersey Island is divided into 12 parishes, and the object of this award is to work a station in each of those parishes. The award is printed on parchment paper depicting the outline of Jersey, showing each parish and the heraldic arms of the Bailiwick. A rule sheet and full details are available from Ken Kirk-Bayley, GJ6OZB, P.O. Box 338, Jersey, Channel Islands, U.K.

CWP Award. Issued by Clube de Radioamadores de Petropolis—CWP, this award may be obtained in three different classes. Only two-way CW mode and only QSO's after December 1, 1983.

Class 1. Work 10 Brazilian cities plus 2 QSO's with CWP members or delegates (total of 12 QSO's).

Class 2. Work 20 Brazilian cities plus 6 QSO's with CWP members or delegates (total of 24 QSO's).

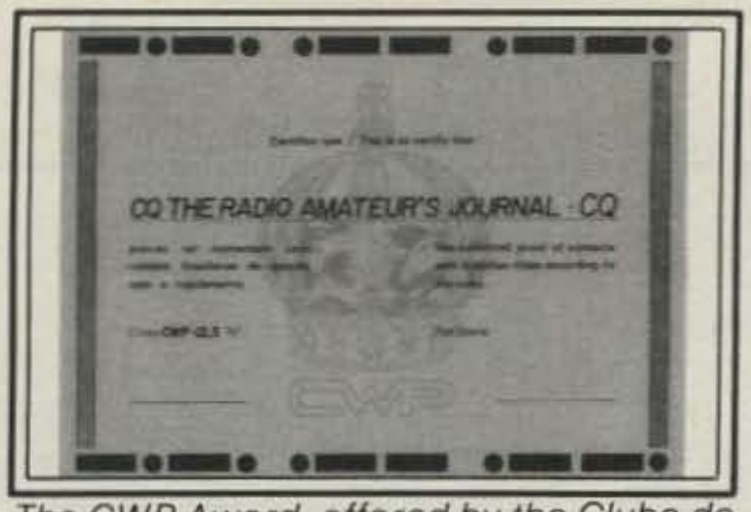
Class 3. Work 30 Brazilian cities plus 2 QSO's with CWP members or delegates (total of 36 QSO's).

One CWP member may be used in log more than once only if worked on different dates and bands.

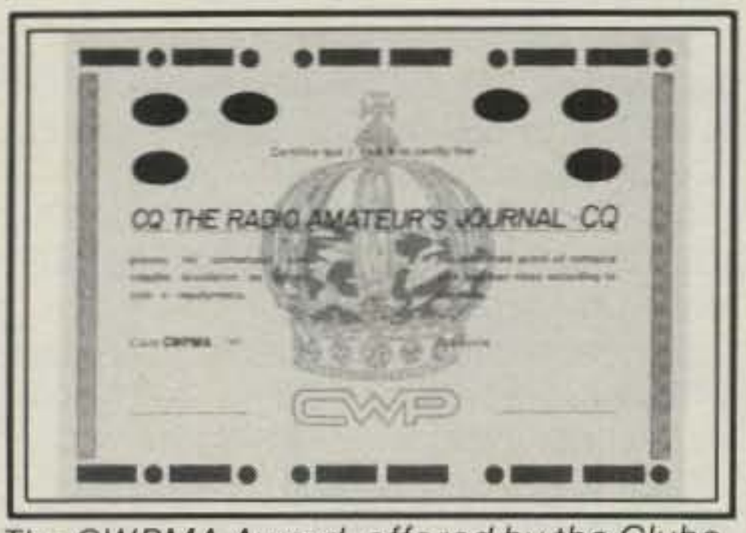
SWL—Same rules apply.

Fee is 7 IRC's, only CGR. Apply to Clube de Radioamadores de Petropolis, CWP, P.O. Box 90415, 25600 Petropolis, RJ, Brazil.

CWPMA Award. This award is issued by Clube de Radiomadores de Petropolis—



The CWP Award, offered by the Clube de Radioamadores de Petropolis for working Brasilian cities after December 1, 1983 (CW only).



The CWPMA Award, offered by the Clube de Radioamadores de Petropolis for working Brasilian cities after December 1, 1984. Award shows additional seals that are available.

CWP. Only two-way CW mode, QSO's after December 1, 1984.

Basic Award: Work CWP members in 5 different Brazilian cities (total: 5 QSO's).

Five endorsements: 2 QWP members (total of 10 QSO's).

Fee: Basic award 5 IRC's. Each endorsement: 1 IRC.

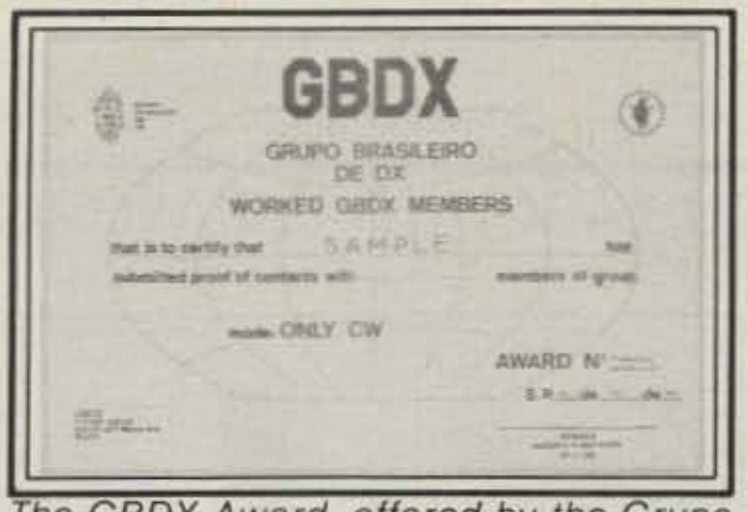
SWL: Same rules.

Apply to Clube de Radiomadores de Petropolis, CWP. P.O. Box 90415, 25600 Petropolis, RJ, Brazil.

CWP Delegates: DL1XT (Germany), KA9KUH (U.S.A.), UJ8JLF (U.S.S.R).

CWP Members: PP1AEA; PP1SL; PP2RR; PP2WV; PP5AS; PP7LL; PP7JCO; PP8ULF; PT2ACZ; PT2GK; PT2KT; PR7AFH; PR8GM; PS8AKL; PT7AI; PT7CG; PT7WA; PU1VEC; PU1WXU; PY1YOC; PU2KDL; PY1: AAK, AJK, APS, AYE, AZ, BPR, BUY, BXT, CC, CFN, COA, CRP, DFF, DRW, DWH, DWM, DYD, EBK, EBN, ECL, ENW, EWN, JF, JN, LVF, PL, QN, QQ, RD, RLS, ROB, SL, TG, URQ, UWI, UX, VMV, VOY, WX, XQ, YN, YT, ZFF; PY2: AC, ADN, IL, KG, KP, KQ, LMA, LPI, MC, MT, RLQ, RRG, UZ, VM; PY3: CJI, MQ, PY4CY, PY5AIW; PY6AMJ; PY7GI; PY7GJ; PY8ATL; PY8MWJ; PY9AC.

Grupo Brasileiro de DX (Brasilian DX Group). The Grupo Brasileiro de DX (GBDX) is an international association with headquarters in Sao Paulo, Brasil, and the Grupo Brasileiro de DX will accept members from any part of the world, CW only. For information about this group



The GBDX Award, offered by the Grupo Brasileiro de DX for contacting members of the GBDX (CW only).

send to: Marcelo Hideo Motoyama, PY2LQB, President of GBDX, P.O. Box 53031, 08200 Sao Paulo - SP, Brasil.

The Worked GBDX Members Award is issued by GBDX to amateur radio operators (CW only) who have worked five members of the group after June 1, 1985.

Work on all band; send GCR and fee of 10 IRC's. One GBDX member may be used for more than one award, but only if worked in different bands.

Members of GBDX as of June 24, 1985: PP2AEA; PP2FN; PP2WV; PP5AS; PT2ACZ; PY1APS; PY1RD; PY1VKA; PY1VMV; PY1XQ; PY2: EJ, FK, KP, LQB, MER, MQA, MT, OIN, OJD, PNA; PY3CJI; PY3NH; PY4PZ; PY5MR; PY8ATL.

The Armadillo Run

Plans for the Texas Armadillo Run are on schedule. See February *CQ* for details. Tom Taormina, K5RC, has a new address: 12610 Barbizon, Houston, Texas 77089. Tom will be glad to answer any questions about the Armadillo Run. His telephone number is 713-481-3816. Let's all get involved and help Texas celebrate!

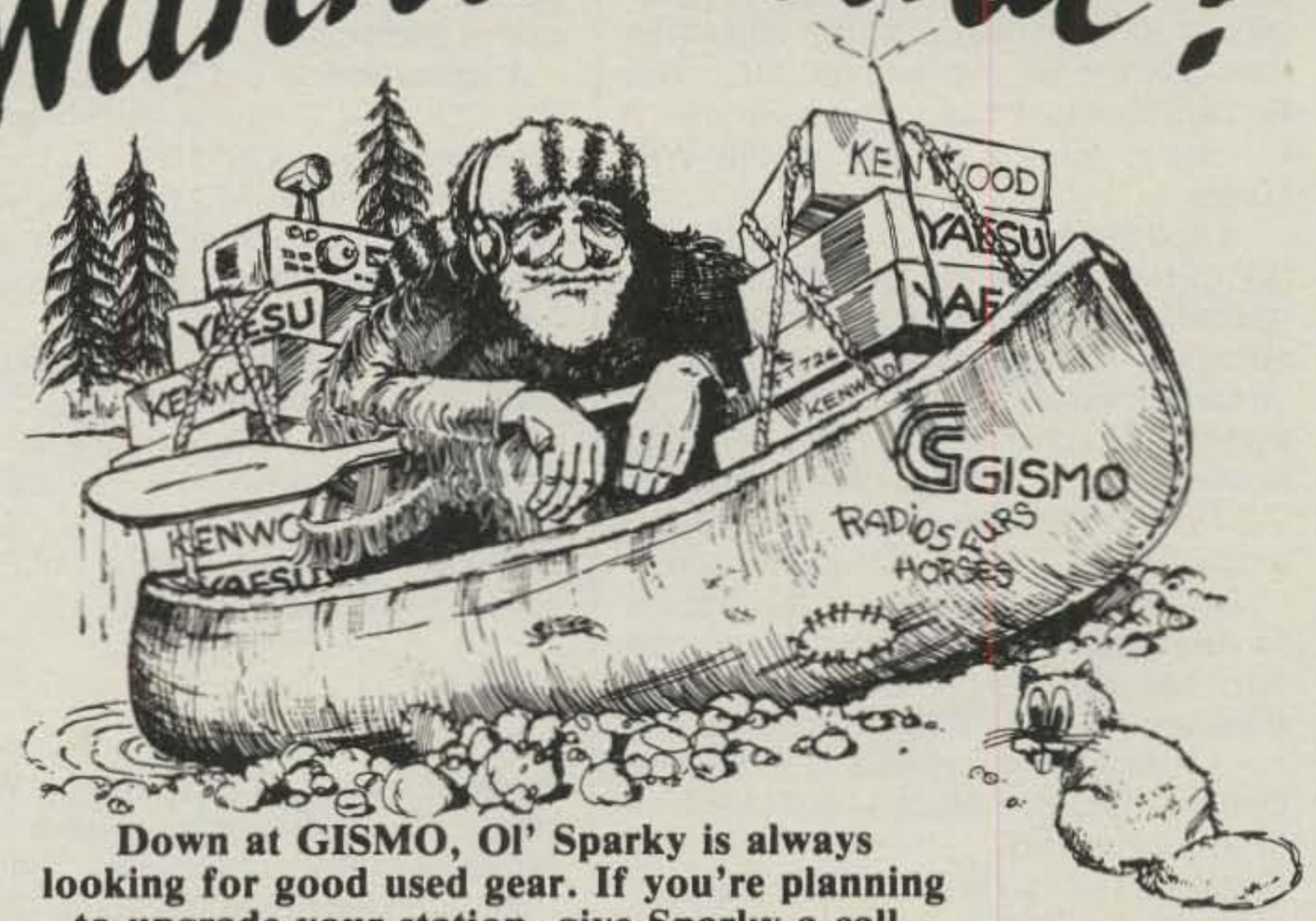
South Australia is also celebrating its 150th birthday during 1986, and will be coordinating some of the special events with the Texas celebration. All South Australia amateurs are permitted to use the special VI prefix until December 31, 1986.

Notes

March brings hints of springtime to the Western Hemisphere, and in northern Illinois it can't arrive a moment too soon. Have you made plans for your summer holidays?

73, Dorothy, WB9RCY

Wanna' trade?



Down at GISMO, Ol' Sparky is always looking for good used gear. If you're planning to upgrade your station, give Sparky a call. Your present equipment may be worth plenty.

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CIRCLE 40 ON READER SERVICE CARD

NO-70-76

DX

This month by
JOHN A. ATTAWAY, K4IIF

NEWS OF COMMUNICATIONS AROUND THE WORLD

George's propagation column shows that Sunspot Cycle 21 is declining rapidly and may hit bottom before the year is out. The sunspot number, which peaked at 165 in December 1979, has slipped below 20 and is predicted to reach a minimum of 7 by October. DXing conditions on the high-frequency bands are poor, on some days downright lousy, and are getting worse.

Does this mean that life has nothing in store but fixing the lawn mower or kibitzing the XYL's bridge game? Most emphatically *NO!* You can work a new one every day, sometimes a dozen new ones, if you are enrolled in *CQ's* WPX, Worked Prefixes Program.

At the bottom of the sunspot cycle WPX is a DXer's dream. There are always plenty of new ones within easy reach of your 40 and 80 meter dipoles, and only 300 prefixes on either CW or SSB will earn you a certificate, 400 by mixed mode. If you have been an active DXer for two years or more, a look through your QSLs will probably find you already approaching the basic certificate, after which endorsement stickers may be earned for each additional 50 prefixes. You could probably start from scratch and earn an award in the *CQ* World-Wide WPX SSB Contest the weekend of March 29 and 30, or in the *CQ* World-Wide WPX CW Contest at the end of May. See Frank's Contest Column elsewhere in this issue for full details on the WPX 'Tests.

In addition to the basic certificates, the WPX Program offers band endorsement stickers and continental endorsement stickers. The band stickers may be earned by confirming 50 prefixes on 160 meters, 175 prefixes on 80 meters, 250 prefixes on 40 meters, or 300 prefixes on 20, 15, and 10 meters, there being a separate sticker for each individual band.

To qualify for the continental endorsement stickers, you must work and confirm 160 North American prefixes, 95 from South America, 160 from Europe, 90 from Africa, 75 from Asia, and 60 from Oceania. Again, there is a separate sticker for each band.

We do not require that QSL cards be submitted to *CQ* in order to qualify for WPX, but the cards must be in your possession. To apply for a certificate, or endorsement sticker, simply list your prefixes on our official WPX application form (*CQ* form 1051A) and send it to the WPX Award Manager, Mr. Norm Koch, K6ZDL, P.O. Box 1351, Torrance, CA 90505. The complete rules for WPX, and a copy of form 1051A, may be obtained by sending a self-addressed, stamped envelope to K6ZDL. A business-size, 4" × 9", envelope is preferred.

P.O. Box 205, Winter Haven, FL 33882

Ed Campbell, KB6DAW/KH2, writes in defense of list and net operations which he feels serve a good cause for those in semi-rare locations such as Guam. He likes the 14.227 net with W7PHO, the 14220 net with P29JS, the 14195 net with RFØFWW, and the 7085 DX net. Ed asks, "If nets are so bad why do such rare stations at TZ6FE, ZM7PM, BY5RA, VK7LH, TA1E, and VKØGC appear with such frequency? On a net, the smaller guy has a chance to work the stations he needs, and can find them. All that's needed is courtesy instead of QRM.

Attention Novices and Shortwave Listeners: The CQ WPX Program also has certificates for Novices and SWL's. U.S. Novices who confirm 100 prefixes, while licensed as Novices and operating in the Novice subbands, qualify for the WPNX Award.

Shortwave listeners world-wide who confirm the reception of 300 different amateur prefixes may earn the VPX (Verified Prefixes) Award.

Rules and application form 1051A for WPNX and VPX may also be obtained by sending an SASE to K6ZDL.

WAZ-50

To celebrate the 50th anniversary of the WAZ Award, *CQ* is offering a WAZ-50 certificate to DXers who work the 40 zones of the world between January 1, 1986 and December 31, 1986. Contacts may be made on the 80, 40, 20, 15, or 10 meter bands using CW, SSB, or other legal forms of emission. See the February issue for full details.

Rare and Unusual Prefixes For Your WPX

AZ1: AZ1A is the callsign being used by LU8DTQ through the end of March from the South Orkney Islands. He is an enthusiastic RTTY operator. QSL to Box 5, 1636 Olivos, Buenos Aires, Argentina.

BV1-BV9: Prefixes on Taiwan are allocated as follows—BV1 = Yilan and Kuelung, BV2 = Taipei, BV3 = Taoyuan and Miaoli, BV4 = Taichung, BV5 = Changhua and Chiayi, BV6 = Tainan, BV7 = Kaohsiun, BV8 = Taitung and Hualien, BV9 = adjacent islands, and BVØ = special stations.

BVØ: Club station BVØCRA celebrated the Festival of the China Radio Association. QSL to C.R.A., Box 30-547, Taipei, Taiwan, Republic of China.

CH: Used by Canadians in November 1985 to celebrate the 100th Anniversary of the Louis Riel Rebellion.

CU: Beginning December 1, 1985, the following prefixes are being used from the Azores Islands—CU1–Santa Maria Island, CU2–Sao Miguel Island, CU3–Terceira Island, CU4–Craciosa Island, CU5–Sao Jeorge Island, CU6–Pico Island, CU7–Faial Island, CU8–Flores Island, CU9–Corvo Island, and CUØ is for repeaters. These prefixes replace CT2, which formerly covered all of the Azores.

CVØ: The Uruguay DX Group operated from Isla de Flores in December using the callsign CVØU. QSL to CX2CS, P.O. Box 20063, Montevideo, Uruguay.

EFØ: EFØNG was a special-event station from Spain. It is only the second time that the number Ø has been used in a Spanish callsign, the first being EAØJC, which is the call of King Juan Carlos.

FF: This two-letter combination may now be used by club stations in France. FF6 will be a common prefix; FF2 and FF5 will be less common; and FF3, FF8, and FF9 will probably be quite rare.

JY5Ø: This special prefix was used from November 7–21, 1985 by the Royal Jordanian Radio Amateur Society to celebrate the 50th birthday of King Hussein. U.S. and Canadian amateurs who contacted 5 Jordanian stations using the JY5Ø prefix may obtain an award from the society. For full information write to JY5Ø Celebration, P.O. Box 2353, Amman, Jordan.

PQ8: Ronaldo Reis, PT2ADV, operated /PQ8 from Amapa Territiry in late 1985. QSL to Box 04-146 Brasilia, DF 70312, Brazil.

TP2: TP2I is the callsign of a special station at the headquarters of the Council of Europe in Strasbourg. The station director is F6FQK.

VI5: VI5IYY was active from Boston Island, just off the south coast of Australia, in December. QSL to P.O. Box 937, Port Lincoln, SA-5606 Australia.

5L2: This special prefix was used by Liberian amateurs during November 1985 to honor Radio Liberia.

Say You Saw It In CQ

The WPX Program

Mixed

1189	I2PJA	1191	YU2RVF
1190	HB9CSA		

S.S.B.

1773	LA2TO	1776	EA2AJT
1774	I2PJA	1777	EA5FCP
1775	HB9CSA	1778	K7JXR

CW

2340	OK1FIW	2342	W4RHZ
2341	PA3BFH		

Endorsements

Mixed: 450 I2PJA, HB9CSA, W1DOW. 500 I2PJA, HB9CSA, LU1DOW. 550 I2PJA, HB9CSA, W1DOW. 600 I2PJA, HB9CSA, LU1DOW. 650 I2PJA, HB9CSA, LU1DOW. 700 I2PJA, HB9CSA, KA1SR. 750 I2ØJA, HB9CSA, KX7J. 800 I2PJA, HB9CSA, W9MYG. 850 I2PJA, HB9CSA, W9MYG. 900 I2PJA, HB9CSA. 950 AI6Z, I2PJA,HB9CSA. 1000 AI6Z, I2PJA, HB9CSA. 1050 I2PJA. 1100 I2PJA. 1150 I2PJA. 1200 I2PJA. 1250 I2ØJA. 1300 I2PJA. 1350 I2PJA. 1400 I2PJA. 1450 I2PJA. 1500 I2PJA. 1550 I2PJA. 1600 I2PJA. 1950 N9AF.

S.S.B.: 350 LA2TO, I2PJA, HB9CSA. 400 LA2TO, I2ØJA, HB9CSA, WA4PMF, JO1BMV, K8KUH. 450 LA2TO, I2PJA, HB9CSA, KE6KT. 500 LA2TO, I2PJA, HB9CSA, KE6KT. 550 LA2TO, I2PJA, HB9CSA. 600 AI6Z, LA2TO, I2PJA, HB9CSA. 650 AI6Z, LA2TO, I2PJA, HB9CSA. 700 LA2TO, I2PJA, HB9CSA. 750 IK5ACO, LA2TO, I2PJA, HB9CSA. 800 IK5ACO, LA2TO, I2PJA. 850 LA2TO, I2PJA. 900 LA2TO, I2PJA. 950 LA2TO, I2PJA. 1000 I2PJA. 1050 I2PJA. 1100 I2PJA. 1150 I2PJA., I1POR. 1200 I2PJA, I1POR. 1250 I2PJA, I1POR. 1300 I1PJA, I1POR. 1350 I2PJA. 1400 I2PJA. 1450 I2PJA. 1500 I2PJA. 1550 I2PJA. 1600 I2PJA. 1650 WD8MGQ. 1700 WD8MGQ.

C.W.: 350 OK2PFX, PA3BFH, W4RHZ. 400 OK2BFX, PA3BFH, W4RHZ. 450 OK2BFX, PA3BFH, W4RHZ. 500 OK2BFX, HB9CSA, PA2BFH, JO1BMV, W4RHZ. 550 OK2BFX, HB9CSA. 600 OK2BFX, HB9CSA. 650 KN7K, HB9CSA. 700 HB9CSA. 750 HB9CSA. 750 HB9CSA. 800 AI6Z. 850 AK2H.

10 meters: WA8YTM.
20 meters: OK2BFX.
40 meters: OK2BFX.
80 meters: HB9CSA.
160 meters: KA1SR.

Asia: HB9CSA.
No. America: HB9CSA, KA1SR.
Europe: HB9CSA, AI6Z, OK1FIW, PAØMA.
Oceania: AI6Z.

Award of Excellence Holders: K6XP, K2VV, VE3XN, DL1MD, DJ7CX, DL3RK, WB4SIJ, DL7AA, ON4QX, YU2DX, OK3EA, OK1MP, N4NO, ZL3GQ, W4BQY, IØJX, WA1JMP, KØJN, W4VQ, KF2O, W8CNL, W1JR, F9RM, W5UR, CT1FL, W8RSW, WA4QMQ, W8ILC, VE7DP, K9BG, W1BWS, G4BUE, N3ED, LU3YZ/W4, NN4Q, KA3A, VE7WJ, VE7IG, N2AC, W9NUF, N4NX, SMØDJZ, DK5AD, WD9IIC, W3ARK, LA7JO, VK4SS, K6JG, N4MM, I8YRK, W4CRW, SMØAJU, K5UR.

Award of Excellence Holders with 160 Meter Endorsement: OK1MP, W8CNL, W1JR, W5UR, W8RSW, W8ILC, W1BWS, G4BUE, LU3YL/W4, VE7WJ, W9NUF, N4NX, SMØDJZ, DK5AD, W3ARK, LA7JO, W4VQ, K6JG, W4CRW, N4MM, SMØAJU, KF2O, K5UR.

Complete rules and application forms may be obtained by sending a business-size, self-addressed, stamped envelope (foreign stations send extra postage if air-mail desired) to CQ WPX Awards, P.O. Box 1351, Torrance, CA 90505-0351 U.S.A.

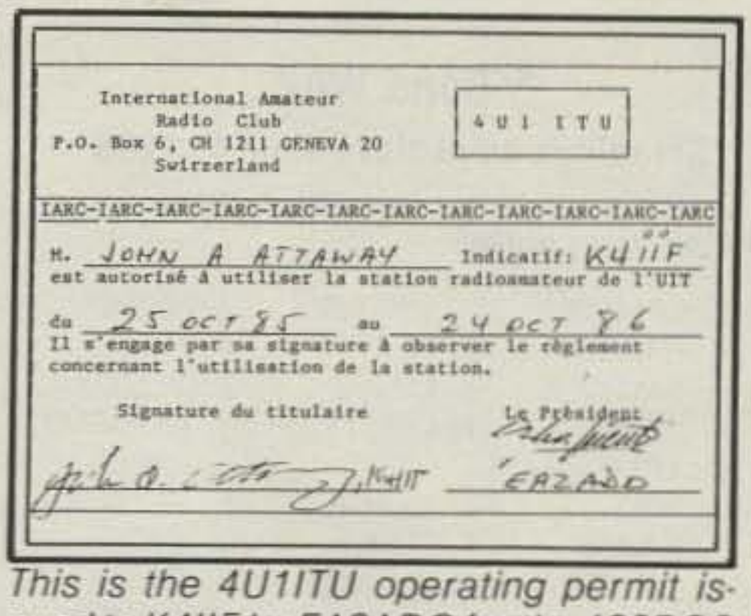
6W5: The rare 6W5 prefix was activated by 6W5NA. He was heard Sundays on 14 MHz at around 1700 UTC.

7J1: U.S. amateurs may use this prefix from Japan under the reciprocal agreement. QSLs for 7J1AAA go to JA1XGI.

8P9: 8P9 is the prefix for visitors to Barbados.

Operating the Contest from 4U1ITU

K4IIF had planned another Caribbean operation for the 1985 *CQ* World-Wide Phone Contest, but when an invitation arrived asking us to speak at a seminar in Heidelberg, Germany on October 24, 1985, the situation changed quickly. It was obvious that presenting the seminar on October 24, then rushing back to the Caribbean *in shape for a contest* beginning the night of October 25, was simply not practical, and the scrambling started to find a suitable European location for the 'Test. Would it be /DL, HBØ, LX, or, perhaps 4U1?



International Amateur Radio Club
P.O. Box 6, CH 1211 GENEVA 20
Swirzerland

4 U 1 I T U

IARC-IARC-IARC-IARC-IARC-IARC-IARC-IARC-IARC-IARC-IARC-IARC

M. JOHN A ATTAWAY Indicatif: K4IIF
est autorisé à utiliser la station radioamateur de l'UIT

du 25 oct 85 au 24 oct 86
Il s'engage par sa signature à observer le règlement concernant l'utilisation de la station.

Signature du titulaire — Le Président

K4IIF — EA2ADO

This is the 4U1ITU operating permit issued to K4IIF by EA2ADO for the 1985 CQ Worldwide DX Contest. Presenting this permit to the security desk at the ITU building in Geneva gets you the keys to the 4U1ITU shack at anytime on a 24 hour per day basis. A permit for one year is obtainable by contributing 25 Swiss Francs to the 4U1ITU operating fund.

Several attempts were made to reach Franz Langner, DJ9ZB, by telephone to seek advice on the current European scene, but Franz was not at home. An effort was then made to contact Ted Robinson, F8RU, at the ITU in Geneva, but we found that Ted had retired and was no longer president of the International Amateur Radio Club, the group who operates and maintains the 4U1ITU station. We were finally directed to the new president of the club, Mr. Francisco (Paco) Lafuente, EA2ADO, and arrangements were made to operate the contest during the contest weekend, October 26–27, 1985.

Operating a *CQ* World-Wide DX Contest from the only station in an amateur radio country located in the middle of the European continent is an exciting experience. Everyone needs you for a multiplier and the pileups are fantastic. Unfortunately, the pileups cannot be managed by listening for "4's only" or for "6's only" as there are so many countries with large amateur populations within a one-skip distance from Geneva. We found that the best strategy was just to take them as they came, except for occasional periods when we would ask only for a specific zone or a specific country to lessen the bedlam or snare a multiplier for ourselves.

Early on, one is impressed by the fact that stations that are only S8 or S9 from the states or from the Caribbean are suddenly 40 over 9 in Europe. The Italian, Yugoslavian, and Bulgarian contesters are particularly loud, and callsigns such as UP and UR are worked in sets of six instead of singly. Even RA9's, UL7's, and UF6's are garden-variety contest DX.

One of the more interesting facets of contest operation from Europe is picking a listening frequency for the U.S. on 40 meters. The noise level above 7150 kHz must be heard to be believed. At one time we wondered how a European station picked a specific frequency, such as 7276 kHz, as his listening frequency. Well, here is how and why it's done. You tune across the band through a constant roar of 40–60 dB over S9 QRM until you find a spot where the bedlam is only 10 or 20 dB over S9. That will be your listening frequency. Unfortunately, the situation becomes complicated when you find that other European stations are listening on the same frequency for the same reasons, and after you dig out a stateside station's call letters, you find that he is answering someone else.

In the 1985 contest the combination of sporadic-*E* type short skip with F2 long skip produced some unusual situations. At one time we ran off 34 G, GM, and GW stations on 10 meters, interrupted only by ZD and LU, after which 11 consecutive CE's were worked.

Will You Be in Geneva This Summer?

If you plan to visit Geneva and you would like to operate the 4U1ITU station, arrangements can easily be made by submitting a copy of your license, and an annual fee of 30 Swiss Francs, to I.A.R.C. President Paco, EA2ADO, on arrival in Geneva. However, be forewarned that 4U1ITU is usually reserved far in advance for major contests. In fact, the sta-

The WAZ Program

10 Meter Phone

304 W6TMD

15 Meter Phone

227 KA2BZS

20 Meter Phone

549	KØRDJ	551	K8NLD
550	AB9O		

40 Meter Phone

34 JA4JBZ

All Band WAZ

S.S.B.

2994	NN7L	2997	EA2AOM
2995	W6CZN	2998	NN2G
2996	IØSNY		

C.W. and Phone

5925 KA7KMP

Applications and reprints of the latest rules may be obtained by sending a self addressed stamped envelope (37 cents) size 4½ × 9½ to the WAZ Manager, Leo Haijsman, W4KA, 1044 S.E. 43 Street, Cape Coral, Florida 33904. Applicants forwarding QSL cards either direct to the WAZ manager or to a check point should include sufficient postage for safe return of their QSL cards. The processing fee for all C.Q. awards is $4.00 for subscribers and $10 for non-subscribers. In order to qualify for the subscriber rate, please enclose your latest *CQ* mailing label with your application.

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CIRCLE 27 ON READER SERVICE CARD

5 Band WAZ

Standings as of November 1, 1985

All 200 zones worked:

1. ON4UN
2. K4MQG
3. SM4CAN
4. AA6AA
5. W8AH
6. W6KUT
7. EA8AK
8. LA7JO
9. EA3SF
10. OH1XX
11. EA8OZ
12. W0SD
13. K0ZZ
14. ON6OS
15. OK3TCA
16. K6SSS
17. ZL3GQ
18. OK3CGP
19. SM0AJU
20. OZ3PZ
21. I3MAU
22. I2ZGC
23. 4Z4DX
24. N4KE
25. K5UR
26. K9AJ
27. SM3EVR
28. LA5YJ
29. DL3RK
30. N4WJ
31. G3MCS
32. SM5AQD
33. W0MLY
34. I0RIZ
35. ON5NT
36. OH6JW
37. OK1AWZ
38. IV3PRK
39. DJ6RX
40. OH3YI
41. I4RYC
42. ZL1BIL
43. I4EAT
44. ZL1BQD
45. TG9NX
46. XE1J
47. F5VU
48. W3AP
49. YO3AC
50. K3TW
51. XE1OX
52. VE7IG
53. OK1ADM
54. CT1FL
55. WA1AER
56. N4RR
57. UW0MF
58. W4DR
59. OK1MP
60. W1NW
61. OE1ZJ
62. HB9AHL
63. HB9AMO
64. LA6OT
65. UR2QD
66. UK2RDX
67. ZS5LB
68. F6DZU
69. DL4YAH
70. LA7ZO
71. W9ZR
72. W1NG
73. VK9NS
74. N4KG
75. YU7DX
76. DL8MAG
77. OK3DG
78. ZL1BOQ
79. EA9IE
80. DL7HZ
81. DJ9RQ
82. EA5SP
83. EA2IA
84. SP3BQD
85. LZ1NG
86. N4JF
87. CT2AK
88. HB9CIP
89. OK1MG
90. CT4BD
91. VK6HD
92. EA6ET
93. VK3QI
94. LZ2DF
95. ON4QX
96. SM0DJC
97. CT3BM
98. K2TQC
99. EA8XS
100. HA9RE
101. SM4CTT
102. A71AD
103. LZ2CC
104. SM4CLE
105. LZ1HA
106. SM5AKT
107. CT4NH
108. ZL4BO
109. I1BSN

The top 14 contenders for 5 Band WAZ are:

1. DK5AD, 199
2. JA1BWA, 199
3. JA3EMU, 199
4. N4WW, 199
5. K6YRA, 199
6. W8UVZ, 199
7. LU8DPM, 199
8. LA9GV, 198
9. W6GO, 198
10. K4CEB, 198
11. W2YY, 198
12. G3GIQ, 198
13. K7UR, 198
14. W3GG, 198

347 Stations have attained the 150 zone level

Mike Smedal, A71AD, in Qatar worked all zones on both 15 and 20 meters and has now qualified for 5-Band WAZ #102. Mike is 50, an American national and an electronic engineer. He has been an amateur for 34 years and has operated SSB for 33 years, being a pioneer on that mode. He was the first foreign national to receive an A7 license and formerly operated from Iran as EP2LI. His rig includes a Yaesu FT-One, Alpha 77SX, a TH7DX, 402BA, and an inverted Vee for 80. He is shown with his youngest child.

tion may already be reserved for the 1986 *CQ* World-Wide Phone and CW Contest weekends.

It is a simple matter to phone Paco directly from the U.S. His office number in Geneva is 99-5349. If there is no answer, a message may be left at the main I.T.U. number, which is 99-5111, or you may contact the club secretary, Philippe Capitain, at 99-5992 or station engineer David Kaplan at 99-5330. To direct dial from your home, simply pick up the phone and dial 011-41-22-99-5349. In this sequence of numbers, 011 is the international access number for a station-to-station call, 41 is the country code for Switzerland, 22 is the city code for Geneva, and 99-5349 is Paco's office number. If you want to make your call person-to-person or charge it to a credit card, then simply dial 01, instead of 011, and an operator will assist you. If you call from the states, keep in mind the 6-hour time-zone difference. At 9 a.m. on the U.S. east coast it is already 3 p.m. in Geneva.

Be advised that while 4U1ITU is a good, solid communications station, it is not intended to be a contest super station. There are no massive monoband arrays. The antennas include a Fritzel FB33, 3-element triband Yagi, a DJ2UT P-507, 8-element 7-band Yagi (including WARC bands), inverted-Vee dipoles for 40 and 80 meters, and a ¼-wave sloper for 160 meters. There are four complete high-frequency operating positions, so multi-operator multi-transmitter operation is easily carried out within the station rule which limits contest groups to three operators and does not allow camping in the shack. There are also two VHF/UHF positions if 2 meters and up are of greater interest to you.

At the time of the 1985 *CQ* World-Wide Phone Test, the four HF operating positions were equipped as follows:

Position 1: Yaesu FT901DM and FL2100B linear.

Position 2: Collins KWM2 and 30L1 linear.

Position 3: Kenwood TS820S and FL2100B including WARC bands, or ICOM 745.

Position 4: Kenwood TS930S and TL922 with WARC bands plus Microlog RTTY unit with ACT-1 and video display.

In addition, contest operators are allowed to install their own equipment with the agreement and supervision of the 4U1ITU station engineer. This was done during the 1985 test by Walter, DJ6QT, who brought in his own ICOM rig. Walter had planned to operate the contest from

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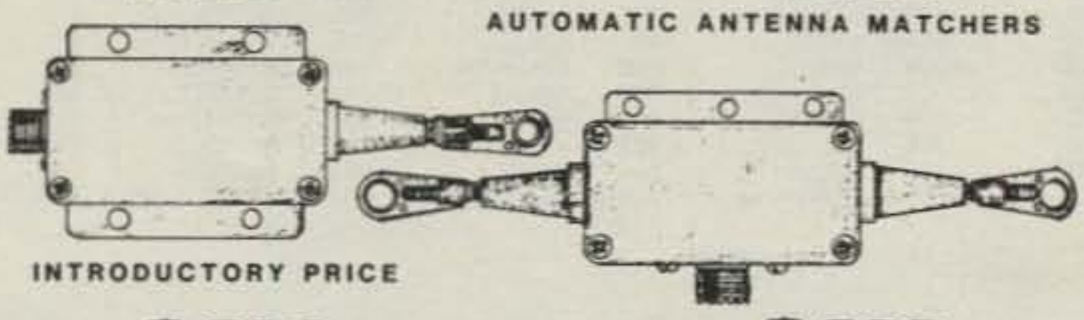

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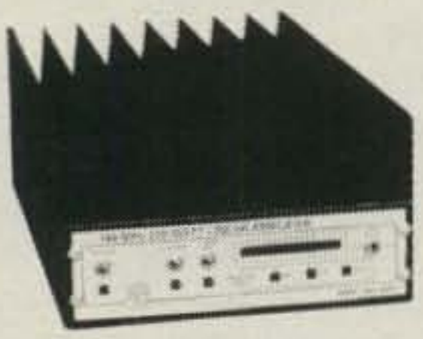

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3A-Monaco, but was unable to do so because of last-minute licensing difficulties, and he hurried back to Geneva and joined our group Saturday morning. Due to a scheduling mix-up with a German group who had also reserved the station, the single-operator single-transmitter effort originally planned by K4IIF had turned into a multi-operator multi-transmitter entry. The group consisted of Stephan, DL4BBO, Walter, DJ6QT, Ben, DL6FBL, and John, K4IIF. QSL's go via Leo Haijsman, W4KA, 1044 Southeast 43rd St., Cape Coral, FL 33904.

New DX Club Officers

Officers for the 1985-86 year have been reported by several clubs as follows:

Central Arizona DX Association (Phoenix area): Lee Finkel, KY7M, President; Del Hull, KC7CE, Vice President; Jim McDonald, N7US, Secretary; and Bill Andrews, W8AKH, Treasurer.

North Florida Amateur Radio Society (NOFARS) (Jacksonville area): Billy Williams, N4UF, President (N4UF is also *CQ* DX Award Manager); Pete Nissen, W4PTT, Vice President and DX Editor; Larry Goosby, AA4JI, Secretary; Glenn Ralston, KI4TP, Treasurer; and Steve Barber, WA4B, Activities Manager.

Redwood Empire DX Association (North of San Francisco to Oregon border): WA6NBR, President; WA0JRB, Vice President; VP2ML, Secretary/Treasurer; and Board Members KF6RK and WG6H. The club's mailing address is P.O. Box 4881, Santa Rosa, CA 95402.

Willamette Valley DX Club (Portland, Oregon area): Jim Fenstermaker, K9JF, President; Mike Huey, W7ZI, Vice President; Rollie Johnson, N7FAK, Secretary; Dave Norton, AB7O, Treasurer; and two new Directors, KW7N and KA7BSD.

Here and There

Visalia International DX Convention: The 1986 International DX Convention will be held at the Airport Holiday Inn, Visalia, California on April 18, 19, and 20. For reservations, call (209) 651-9000 and ask for Mary Kimber. The Southern California DX Club has contracted for 225 rooms, but they are going fast. If Visalia is in your plans for 1986, you had best act quickly. Rates are $42.00 single, $50.00 double, $55.00 triple, and $60.00 for 4 persons.

Yasme DXpeditions: At the time of this writing, Lloyd, W6KG, and Iris, W6QL, Colvin are operating from many different countries in southern and eastern Africa under the Yasme Foundation banner. QSLs for all of these operations go to P.O. Box 2025, Castro Valley, CA 94546.

Northern California DX Club Bulletins: W6TI, the NCDXC memorial station, broadcasts DX bulletins each Sunday at 1800 UTC or Monday at 0200 UTC on 14002 kHz. The station trustee is Bob, W6RGG.

CQ DX Honor Roll

The CQ DX Honor Roll recognizes those DXers who have submitted proof of confirmation with 275 or more ACTIVE countries for the mode indicated. The ARRL DXCC Countries List is used as the country standard. Honor Roll listing is automatic when submitting application or endorsement for 275 or more countries. Deleted countries do not count and are dropped from listing as they occur. Total countries are now 315. To remain on the CQ DX Honor Roll, annual updates are required. Honor Roll updates may be made at any time, in any number. Updates indicating "no change" will be accepted to meet the annual requirement. All updates must be accompanied by an SASE for confirmation. The fee for endorsements involving the issuance of a sticker is $1.00.

C.W.

ON4QX	316	K6EC	312	AB4H	304	WD9IIX	294	JH1VRQ	281
W9DWO	316	W6ID	311	SM6CST	304	W9RY	293	K7ZR	280
W6PT	316	W4BQY	310	WØIZ	303	N5DX	291	I5XIM	280
K4CEB	316	DL3RK	310	WA8DXA	302	I3OBO	290	W2LZX	280
N4JF	316	K4XO	309	YU2TW	301	WA4JTI	290	K1VHS	280
K9MM	315	AA6AA	309	EA2IA	301	W1WLW	289	HB9AFI	279
N4PN	315	N4MM	308	SM3EVR	300	W4BV	289	W6YQ	279
DL7AA	314	W9BW	308	W6SN	300	N8MC	288	WA4DAN	278
W3GRS	314	K1MEM	308	WØSR	299	WA2HZR	286	WB4RUA	277
W8KPL	314	W4OEL	307	K3FN	298	K8LJG	284	DL1QT	277
K6LEB	314	W1NG	306	W7CNL	298	WD9IIC	284	G2GM	276
N6AV	313	OK1MP	306	DJ7CX	297	K4CXY	283	NN4Q	276
K6JG	313	K9QVB	306	K3UA	295	WØHZ	283	KA3R	276
N6CW	313	N4KG	305	K9IW	294	K8PYD	281	K4SE	275

S.S.B.

K2FL	316	I8YRK	312	EA1QF	305	JH4PRU	298	VE3CYX	285
W4EEE	316	WØSD	312	KZ8Y	305	K8VFV	298	KE4HX	285
K6WR	316	K9RF	312	KB8KW	305	EA9IE	298	WA2FKF	284
W4UG	316	K8LJG	312	XE1J	304	XE1NI	298	KB5RF	284
W6EUF	316	K4MQG	312	WB1DQC	304	HP1JC	297	N8BKF	284
VE3MR	316	N4MM	312	W6SN	304	K5DUT	297	W9NUF	284
DL9OH	316	I2LLD	312	VE7HP	304	NA5W	297	VE3DLR	284
N4JF	316	VE7WJ	312	XE1KS	303	YU7KV	296	AG9S	284
IØZV	316	W9SS	312	W2LZX	303	KE3A	296	KD8V	284
KD8VM	316	N2SS	312	KR9O	303	WB3GPR	296	WB3HAZ	283
IØAMU	316	N7RO	312	KU9I	303	KC8EU	296	WD8PUG	283
F9RM	316	LA7JO	312	IØMBX	303	KQ9W	296	VE3MV	283
TI2HP	316	OE2EGL	312	W6NLG	303	KB3KV	296	IN3ANE	283
KS2I	316	K6EC	311	K1MEM	302	I8ACB	295	KI3L	283
W3GRS	315	W4SSU	311	N5FG	302	I3OBO	295	AE5B	282
VE3MJ	315	I4LCK	311	W6FET	302	K7LAY	295	CT1UA	282
I8AA	315	LU3YL	311	W2FGY	302	WØIYR	295	KC8YM	282
4Z4DX	315	W8PCA	311	K9HQM	302	KKØC	295	AI9R	282
W9DWQ	315	K9BWQ	311	KV2S	302	W4BQY	295	TG9EP	282
W9JT	315	YU1DZ	311	WA4DAN	302	I8ZTE	294	W5LLU	281
ZL1AGO	315	K6XP	310	K9IW	302	NN4Q	294	K9TI	280
W4NKI	315	DK2BL	310	K9UAA	302	WDØBNC	294	N5FW	280
VE2WY	315	K4XO	310	NJ2C	302	I5BDE	294	ZL1BOQ	280
K6YRA	315	IV3YRN	310	KP4EQF	302	IØSGF	294	G4FAM	280
W3AZD	315	AA6AA	310	VE3FJE	301	K4SE	293	VE6PW	280
XE1AE	315	W8JXM	310	WB4NDX	301	KC8JH	293	KA8T	279
VE3GMT	315	N6OC	310	WA3HUP	301	AI5I	293	KB5DN	279
ZL3NS	315	W7FP	310	K8CMO	301	KB3OQ	293	EA3KW	279
EA2IA	315	DL6KG	310	W8ILC/QRPp	301	I1POR	293	EA6DE	279
YV1KZ	315	WA4JTI	310	AI8S	301	WA4LOF	292	W9OKL	279
DJ9ZB	315	VE3GCO	309	W1LQQ	301	ACØA	292	JH8NYK	279
W4DPS	315	N4PN	309	W9RY	301	I2MOP	292	KX5V	279
I4ZSQ	315	K1UO	309	YU2TW	301	VE3FEA	292	AI8M	278
I8KDB	314	9H4G	309	W4UNP	301	VP9CP	292	K4BYK	278
N4WF	314	W6DN	309	N4CRU	301	W8LKG	292	I5EFO	278
OZ3SK	314	W7OM	309	W8IMZ	301	XE1OW	292	VE3IUE	278
K9MM	314	W1NG	308	W4OHZ	300	W6BCQ	292	K3LUE	278
YV5DFI	314	VK4VC	308	I5EFO	300	VE3IPR	291	KB8O	277
K6JG	314	YV5AIP	308	K9QVB	300	N5AWS	291	WBØUFL	277
CT1FL	314	ZL1BIL	308	KB5FU	300	WB6GFJ	291	W4PTT	277
OZ5EV	314	N6AV	308	KB9KD	300	W4JFE	291	KBØSY	277
W2SUA	314	W2CC	308	K3UA	300	K1VHS	291	I8XTX	277
WØSFU	314	N4KG	308	VE4AT	300	W6MFC	291	K2JF	277
WØYDB	314	VE4SK	307	I8KCI	300	KBØU	291	N7ASL	276
K9LKA	313	K8PYD	307	WZ4I	300	K2JLA	291	WA6DTG	276
ZS6LW	313	IØMBX	307	WB3DNA	300	VE3CKP	290	WA4OPW	276
ON5KL	313	WØSR	307	I2ZGC	300	KD5ZM	290	AI9U	276
OE3WWB	313	WD9IIX	307	WB4UBD	300	JA5PUL	289	KC2RS	276
OK1MP	313	SM4CTT	307	KZ2P	300	W9TA	289	WA9IVU	276
VE1YX	313	WD8MGQ	307	WAØTKJ	299	K8ZZU	289	I8INW	275
W9BW	313	G4CHP	307	I6PLN	299	KØGT	288	WB3CON	275
W8ILC	313	KB9OC	307	KB9OC	299	OK1AWZ	288	WB1EAZ	275
EA4LH	313	KB8DB	307	JH1VRQ	299	I8KCI	288	VE7BSM	275
OZ8BZ	313	N4KE	306	XE1OX	299	WØULU	288	K8NWD	275
N6AW	313	WAØDCQ	306	DJ7CX	298	AB9E	287	KA9ABC	275
K5OVC	313	VE3MRS	306	K9SM	298	N3ARK	286	G3XTT	275
F2MO	312	VK3JF	306	I8LEL	298	K4LR	286	G4GED	275
W3GG	312	WA4WTG	306	K8NA	298	N8BJO	286		

International DX Association: IDXA now has a Life Membership category for $100.00. If interested in membership, either the regular membership or the Life Membership, contact John Parrott, Jr., W4FRU, P.O. Box 5127, Suffolk, VA 23435.

Incoming QSL Service: Bill, K4CLA, has established the K4CLA Incoming QSL Service. For full information, contact Bill at 562 Oak Drive, Lexington, SC 29072-9059.

QSL Information Lists: Lars, SM5CAK, publishes two types of QSL routing lists. One list, called "QSL INFO BY SM5CAK," gives current data on recently active DX operations. On the average, 200 stations are listed on each monthly sheet.

The other is called "The Most Complete QSL Manager's List Ever Printed." It is published in alphanumeric installments and will contain almost 20,000 entries spanning a quarter century of DX ac-

Say You Saw It In CQ

This is Jean Brunner, F5VU, winner of 5BWAZ #47. As with many European amateurs, Jean found the Pacific and SEAsia a big hurdle in filling out his needs. The next year or so will be the time for those working on 5BWAZ to clean up the low frequency counters.

tivity when it is fully assembled. Either list is available for $12/year, or both for $15.00. The exclusive North American distributor for SM5CAK publications is Bill Early, WA9AEA, 501 North Hill Road, McHenry, IL 60050.

Spring Contest Operations: VP2MM, VP2MIU, W1CDC/4, and AB1U will operate VP2MM during the CQ CW WPX Contest on May 24 and 25, 1986. QSLs are to go to Rick Casey, AB1U, 85 Hacienda Circle, Plantsville, CT 06479.

A4/15: Omani stations signing their callsigns /15 in November 1985 were taking part in Oman's 15th National Day Celebration. If you worked five A4/15 stations, you are eligible for an award from the Royal Omani Amateur Radio Society, P.O. Box 781, Muscat, Sultanate of Oman.

Franz Josef Land: Two stations in rare Franz Josef Land are RZ1OWA heard on 14015 kHz at 1140 UTC and UA1PAP on 7004 kHz at 0000 UTC.

5 Band WAZ #47

Jean Brunner, F5VU, was first licensed in 1967, being then about 16 years old, and has hardly slowed down since in chasing DX. Currently he holds the French Extra class license and is in management in a manufacturing facility. Jean is still single.

He holds the 5BDXCC #474, is on the DXCC Honor Roll, has the 5BWAS #47, the 5BDUF #1, and is a member of the A1-Operators. He started amateur radio working CW almost exclusively, from 1967 to 1969, and then opened up a bit. He now works phone a lot but still uses CW from time to time. He has 4-element beam behind the QTH in downtown Savigne for 10, 15, and 20 meters and a 2-element beam for 40 meters. For 80 he uses a sloper and an inverted Vee.

His local club is the CDXC—Civray DX Club—many of whom join Jean in watching the French DX nets. The club has about 25 members, all of them Deserving.

Every area has a difficult quadrant to work in the world, and Jean found Zones 26 (SEAsia) and 31 (North and Equatorial Pacific) the difficult ones to fill out for his requirements, this being especially difficult on 80 meters.

F5VU also serves as a QSL Manager, handling the cards for FB8XV, FB8XW, FM7CD, and FM5CD. Currently Jean is interested in more 40/80 action, having 238 countries worked on 80 and 265 countries on 40, the latter being all SSB.

Again it might be noted that some awards are harder to win than others, and the 5 Band WAZ is probably the most difficult major award of all. It takes skill, persistence, DX know-how, and a good and continuing effort to win this award. Jean Brunner, F5VU, certainly shows the kind of DX operator who attains 5 Band WAZ—the best.

QSL Information

The following station would like to be QSL Manager for one or more DX stations: Steve Wilson, KB4MUZ, P.O. Box 491, Montvale, VA 24122.

A35ZH to W6ZH
AH8A to W6OSP
CH1AW to VO1AW
CQ6UW to WA3HUP
CT2FN to F6BCW
CY0SAB (Nov. 18–25, 1985) to VE1ASJ
EC9IR to EA9IB
EL2AK to IK8DYD
FO0LG to K6ANP
H5AY to ZS4NS
H5FXT to VE3FXT
HC8X to K8CW
J5WAD to W6CNA
J37AH to W2GHK
J87A to N4PN
J87DX to K1AR
J87J to K4UEE
JT0DJT to WB8RRS
JW0A to SP2HMT
KH0AC to K7ZA
N4CJB/5N1 to K4ZKG
P42J to W1AX, 60 Warwick Drive, Westwood, MA 02090
PJ2FR to N6KT
TJ1AF to SP7EWL
TN8EE to DL1SBO
TR8IG to N6CW
TZ6FC to DL4BC
UD6BD to W7PHO (SASE essential)
V3CAG to W0JLC
V3CAI to K0RWL
VK0GC to P29JS
VP2ET to K5RX
VP2MLD to WB2LCH
VP2MU to WA6AHF
VP2MW to WA6AHF
VP2VCQ to N6ZZ
VP2VCW to N6CW
VP9AD to W3HNK
WP4O to NP4GD
YJ0AEE to W0JEE
YW3A to YU3AJ
ZC4CZ to G4MGQ
ZC4MR to G4SDJ
ZK3RW (Ron Wright) to KD4RH
ZL7AA to ZL1AMO
ZM0OY to Mrs. Kaye Hannigan, The Terrace, Warrington, Otago, New Zealand
ZS3KC to K1ZLA
3D6BU to Box 64, Manzini, Swaziland
3X0HAB to DL8CM
4S7NMR to KZ8Y
4U1ITU (Oct. 26–27, 1985 *only*) to W4KA, 1044 SE 43rd. St., Cape Coral, FL 33904
4C8J to XE1J
4X4NJ to WA4WTG
5H3HM to VE5UJ
5R8AL to WA4VDE
5T5SR to N4GNR
5X5GK to DJ5RT
6Y3M to KT3M
9H1EL to LA2TO
9L1RN to WI4S
9L3MW to James Droge, 7138 Wilkerson Dr., Rockford, MI 49341
9Q5MA to PA0GAM
9Y4AA to N6TJ

73, John, K4IIF

CQ DX Awards Program

S.S.B.

1445	KD8V	1448	SV2QI
1446	JN1JAH	1449	K8UNP
1447	KG6AR		

C.W.

650	K9BQL

S.S.B. Endorsements

310	W0YDB/314	275	KD8V/284
310	W8JXM/310	275	WA8IVU/276
300	W7OM/309	250	VE2PJ/266
300	W6DN/309	200	W9NO/208
300	WD8MGQ/307	200	K9BQL/201
300	KB8DB/307	150	K8UNP/182
300	WZ4I/300	28 MHz	NE8Q
275	KQ9W/296	28 MHz	JN1JAH
275	WA2FKF/284	3.5/7 MHz	K8UNP
28 MHz	K8UNP	Mobile	JN1JAH

C.W. Endorsements

275	N8MC/288	250	W6DN/254
275	K4CXY/283		

Total number of active countries is 315. The basic award fee for subscribers to CQ is $4. For non-subscribers, it is $10. In order to qualify for the reduced subscriber rate, please enclose your latest CQ mailing label with your application. Endorsement stickers are $1.00. Updates not involving the issuance of a sticker are made free when an s.a.s.e. is enclosed for confirmation of total. Rules and application forms for the CQ DX Awards Program may be obtained by sending a business size, No. 10 envelope, self-addressed and stamped, to CQ DX Awards Manager, Billy Williams, N4UF, Box 9673, Jacksonville, FL 32208 U.S.A. DX stations must include extra postage for air-mail reply. Please make all checks payable to the awards manager.

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Contest Calendar

a monthly feature by
FRANK ANZALONE, W1WY

NEWS/VIEWS OF ON-THE-AIR COMPETITION

Announcement of the North Carolina QSO Party scheduled for February 1–2 was received much too late to make the February issue. In previous years it was held in November, so it was unfortunate that I could not give you this information in time. In case you did participate the mailing deadlinefor your log is March 1st, and logs go to North Carolina QSO Party, c/o K4EG, P.O. Box 3064, Burlington, NC 27215.

Another event that did not make the February deadline was the North American Sprint. Dates for that one were February 2nd for CW and February 9th for the SSB weekend. I'm sure the *National Contest Journal*, sponsors of the "Sprint," got the information to its readers, who are the main participants in this event. Your CW logs go to Rusty Epps, W6OAT, 948-H Kiely Blvd., Santa Clara, CA 95051. The SSB logs go to Rick Niswander, K7GM, 1914 West Cortez Circle, Chandler, AZ 85224. The next "Sprint" will be held on September 14th and 21st.

A bonus for you prefix collectors, and hopefully one that will be activated in the coming WPX SSB Contest, is that as of January 1st two new prefixes have been added to the Cayman Islands. The island of Little Cayman will now sign ZF8, and Cayman Brac will use ZF9. So you fellows planning a contest expedition to the Cayman Islands in the coming WPX Contest should take advantage of the bonus.

A final reminder: Your log for the *CQ* 160 Meter CW Contest should have been in the mail by February 28th. You have to the end of this month, March 31st, to beat the SSB deadline. They can be sent to Don McClenon, N4IN, 3075 Florida Ave., Melbourne, FL 32904, or directly to *CQ*.

I sometimes wonder if contest planners read this column. Just for the record, deadline for events in June is March 15th, and April 15th for July activities. Mailing them directly to my home address gives you an additional few days and also saves us forwarding postage.

73 for this time, Frank, W1WY

Calendar of Events

*	Mar.	1-2	ARRL DX Phone Contest
*	Mar.	8-9	QCWA Phone QSO Party
	Mar.	8-9	RSGB Commonwealth
	Mar.	8-10	Virginia QSO Party
	Mar.	9-10	Wisconsin QSO Party
	Mar.	15-16	Bermuda Contest
*	Mar.	15-16	YL-ISSB CW Contest
	Mar.	22-24	BARTG Spring RTTY Contest
	Mar.	**29-30**	**CQ WW WPX SSB Contest**
	Apr.	9-10	DX-YL to N.A. YL CW
	Apr.	12-13	IBM QSO Party
	Apr.	16-17	DX-YL to N.A. YL SSB
	Apr.	19-20	ARCI QRP Spring CW
	Apr.	26-27	Swiss Helvetia Contest
	May	3-4	County Hunters SSB Contest
	May	10-11	USSR CQ-M Contest
	May	17-18	Michigan QSO Party
	May	17-18	ARI International Contest
	May	**24-25**	**CQ WW WPX CW Contest**
	My 31	-Jun 1	National 6 Meter Contest
	Jul.	**19-20**	**CQ VHF WPX Contest**

* *Covered last month.*

1986 CQ 160 Meter Contest Plaques

CW Contest

World Single Operator: Sponsored by Don Busick, K5AAD

U.S.A. Single Operator (W@AW Memorial): Sponsored by Paul Newberry, N4PN

Europe Single Operator: Sponsored by Edward Sleight, K4SB

Asia Single Operator: Sponsored by James Curran, WD4RCO

World Multi-Operator: Sponsored by Hugh Valentine, N4RJ

SSB Contest

World Single Operator: Sponsored by Don Busick, K5AAD

U.S.A. Single Operator: Sponsored by David Thompson, K4JRB

Europe Single Operator: Sponsored by Frankford Radio Club

Oceania Single Operator: Sponsored by Dixie DX'ers

World Multi-Operator: Sponsored by South East DX Club

RSGB Commonwealth CW Contest

1200Z Sat. to 1200Z Sun., March 8–9

Only RSGB members residing in the United Kingdom and radio amateurs licensed to operate within the British Commonwealth and British Mandated Territories are eligible to participate.

Contacts between stations in the same call area are not permitted. All the British Isles prefixes count as one call area.

Activity will be on c.w. only, and it is requested that operation be confined to the lower 30 kHz of each band, 3.5 through 28 MHz (except for Novice contacts).

Exchange: RST plus a three-figure QSO number starting with 001.

Scoring: Each contact is worth 5 points. In addition, a bonus of 20 points may be claimed for the first, second, and third contact with each call area on each band.

Entries: May be single or multi-band.

Each band is scored separately and totaled for the final all-band score. There is no multiplier; just add the total QSO and bonus points from each band.

Multi-band scores cannot also be used for single-band awards. You can request that a single band be judged for awards. Only single operator entries will be accepted.

Use a separate log sheet for each band and include a summary sheet showing the scoring and a signed declaration that all rules and regulations have been observed.

There is also an SWL section with rules and scoring same as above. If both stations in contact are heard, they can be reported as separate entries for credit.

Awards: Certificates to the first, second, and third place winners in all areas, both single and multi-band, and three Rose Bowl Trophies for the overall winners.

Logs must be received by April 14th and go to: A.K. Gray, G4DJX, 44 Sherwood Avenue, St. Albans, Herts., AL4 9PQ England.

Virginia QSO Party

1800Z Sat. to 0200Z Mon., March 8–10

The Sterling Park ARC of Virginia is again sponsoring this year's party. The same station may be worked on each band and each mode; VA stations may work other in-state stations for QSO and multiplier credit; and VA mobiles in each county change.

Exchange: QSO no. (starting with 001) and QTH. County for VA; state, province, or DX country for others.

Scoring: One point per SSB contact, two points if on CW, RTTY, or SSTV. VA stations multiply total QSO points by sum of states, provinces, DX countries, and VA counties worked.

Others multiply total VA QSO points by the number of VA counties worked (maximum of 95).

Frequencies: CW—60 kHz up from low end of each band. SSB—3930, 7230, 14285, 21375, and 28575. Also Novice bands on CW, and both modes on 160 except in the "DX Window."

Awards: Certificates to winners in each state, province, DX country, and VA county. There are six plaques as follows: to top VA single operator stations, CW/SSB, CW only, Mobile, QRP, and to the top CW/SSB out-of-state station, and 4th area club.

Indicate each new multiplier in a separate column as it is worked. Include a summary sheet with your log, and an SASE if results are desired.

14 Sherwood Road, Stamford, CT 06905

Pictured above is Sandy Anderson, GM3BCL, and a partial display of CQ World-Wide DX Contest phone certificates he won from 1956 through 1984, missing only 1973 and 1982. Nice going, Sandy, you can always use the ceiling when you run out of wall space.

Mailing deadline is April 1st and logs go to Virginia QSO Party, Att: Barry Pybas, KW4I, 313 W. Derby Ave., Sterling Park, VA 22170.

Wisconsin QSO Party

1800Z Sun. to 0100Z Mon., March 9–10

This one is a shorty, only 7 hours, and is again sponsored by the West Allis Radio Amateur Club.

The same station may be worked on each band and mode, and mobiles in each county change. Wisconsin stations may contact other in-state stations for QSO and multiplier credit.

Classes: Single operator, multi-operator, both single and multi-transmitter, Novice/Tech. and club.

Exchange: RS(T) and QTH. County for Wisc.; state or province for others.

Scoring: Phone QSO's count 1 point, 2 points if on CW.

Wisc. stations multiply total QSO points by (U.S. states + VE provinces + Wisc. counties) worked for their final score. DX contacts count for QSO points only.

Others use total Wisc. QSO points by the number of Wisc. counties worked (maximum of 72).

Wisc. mobiles can add a bonus of 500 points to their final score for each county outside their own from which they operate (minimum of 15 QSOs from each county).

Frequencies: CW—3550, 3725, 7050, 7125, 14050, 21150. SSB—3890, 7290, 14290. Other bands may be used.

Awards: To the highest scorers in each state and each province, and the highest aggregate club score. Plus awards to the top scorers in each class for Wisconsin stations.

Logs with more than 100 QSOs must include with their entry a separate dupe sheet for each mode.

1985 WAEDC - High USA CW Scores

Single Opr.

K1ZM	819,868	K3WW	196,474
K1GQ	775,530	WC4E	124,969
K1RX	652,501	W1PH	118,560
W3GM	368,970	W9RE	105,000
K1XM	229,835		

Multi-Opr.

K1AR	353,481	W3AKD/3	15,336
N2WK	55,920		

K1ZM was the continental winner. A total of 57 U.S. logs were received.

Mailing deadline is April 15th to: Wisconsin QSO Party, c/o West Allis Radio Amateur Club, P.O. Box 1072, Milwaukee, WI 53201.

Bermuda Contest

0001Z Sat. to 2400Z Sun., March 15–16

This is the 28th year for this popular contest open to amateurs in the United States, Canada, the United Kingdom, West Germany, and Bermuda.

Stations in the U.S. and Canada may work the U.K., West Germany, and Bermuda. The U.K. and West Germany may work the U.S., Canada, and Bermuda. Activity will be on the 3.5, 7, 14, 21, and 28 MHz bands. Cross-band or cross-mode contacts are not permitted. The same station may be worked on each band, phone and again on CW, providing there is a 30-minute separation between contacts on the same band.

You are limited to 36 hours out of the 48-hour contest period. Off times of no less than three consecutive hours must be clearly indicated on the log. Participation is for single operator stations only and must be from their own residence.

It is recommended that stations operate without the aid of a linear amplifier, in keeping with the spirit of the contest.

Exchange: RS(T) and QTH. Parish for VP9, state for the U.S., province for Canada, county for the U.K., and DOC number for West Germany.

Scoring: Five points for each QSO. Multiply total by number of different VP9 stations worked on all bands. (Note: It's each VP9 station, not each parish.) Counted once only per band regardless of mode used.

Awards: Certificates to top scoring stations in each U.S. state, VE province, U.K. county, and DL DOK. The overall winner in each of the above countries, however, will receive something more substantial—a trophy to be presented at the Society's Annual Dinner in Bermuda in October. Round-trip transportation and hotel accommodations will be provided for the winners. (Note: Winners in '81, '82, '83, '84, and '85 are not eligible.)

Use a separate log sheet for each band and a dupe sheet for logs with 200 or more contacts. A penalty of three contacts will be deducted for each duplicate contact for which points are claimed. An excessive number of claimed duplicates means disqualification. The usual signed

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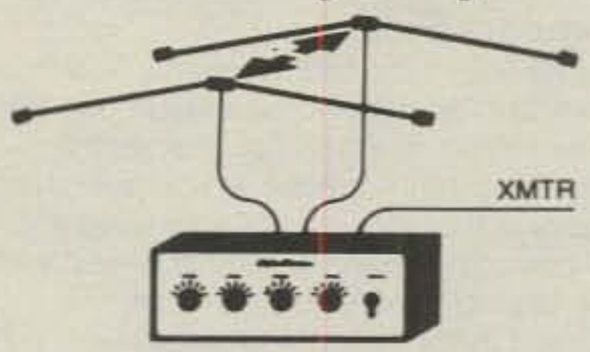

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declaration is also required.

Entries must be received no later than May 31st by the Radio Society of Bermuda, Box HM275, Hamilton 5, Bermuda.

Winners in the 1985 contest were K2UR, VE1NG, G4BWP, DF9ZP, and VP9HK.

The Worked All Bermuda Award can no longer be obtained by contest log information. Proof of contact with all nine parishes is required in the form of QSL cards. Send your application to the above address attention the Awards Manager.

B.A.R.T.G. Spring RTTY Contest

0200Z Sat. to 0200Z Mon., March 22–24

This contest is sponsored by the British Amateur Radio Teleprinter Group and is being administrated by Peter Adams, G6LZB. The contest is open to all amateurs in three classes—single operator, multi-operator, and SWL.

Activity will be on all bands 3.5–28 MHz, but no 10 MHz. Operation is limited to 30 hours out of the 48-hour contest period. The 18 hours off may be taken at any time, but not less than 3-hour periods.

Exchange: RST plus a three-figure contact number and time in GMT (full four figures).

Points: Contacts with stations within own country 2 points. With stations in other countries 10 points. And a bonus of 200 points for each country worked on each band including your own. The same station may be worked on each band for QSO and multiplier credit.

Multiplier: Total number of countries worked on each band and number of continents worked (continents are counted once only). W/K, VE/VO, and VK call areas will be counted as separate multipliers.

Final Score: (a) Total QSO points × country multiplier. (b) Country multiplier × bonus points × continents worked. Add sum of (a) and (b) for your final score.

Shortwave listeners must show call of station being heard, report of message being sent, and call of station being worked.

Awards: Certificates to the top-scoring stations in each class and to the continental leaders. Also in each W/K, VE/VO, and VK call area.

Use a separate log sheet for each band and a summary sheet showing the scoring, etc. Log forms are available from G6LZB; include 4 IRCs to cover postage.

Logs must be received by May 31st and go to: Peter Adams, G6LZB, 464 Whippendell Road, Watford, Herts. England WD1 7PT.

CQ World-Wide WPX Contest

SSB: March 29–30 CW: May 24–25
Starts: 0000Z Sat. Ends: 2400Z Sun.

Complete rules were published in the January issue. They are the same as those used last year with the same format that has been in use these past many years. Therefore, it would serve little purpose to repeat them again, since they are well established world-wide. Following are a few points to keep in mind.

Only 30 hours out of the 48-hour contest period may be used by single operator stations. Off times can be taken in up to five periods. Multi stations can operate the full 48 hours.

The QRP section has become very popular and is worth your attention.

The definition of the prefix multiplier is spelled out in detail and is not to be confused with the interpretation used by the *CQ* WPX Award program. Also bear in mind that stations in call areas different than that indicated by their call signs are required to sign portable.

The multiplier is determined by the number of different prefixes worked and is counted *once* only, regardless of how many times it is worked on other bands.

Another point to keep in mind is that in the multi-operator, single transmitter category only one transmitter and only one band may be used during the same 10-minute period. Picking up a new multiplier on another band during the same time period is definitely prohibited.

An alphabetical/numerical check list of claimed prefixes is a requirement and must be included with your log.

An updated trophy and plaque awards list now shows over 40 awards. Be sure to check the awards that are available.

Deadline for submitting your SSB entry is May 10th, and July 10th for the CW section. Be sure to indicate SSB or CW on the envelope.

All logs go to: *CQ* Magazine, WPX Contest, 76 N. Broadway, Hicksville, NY 11801

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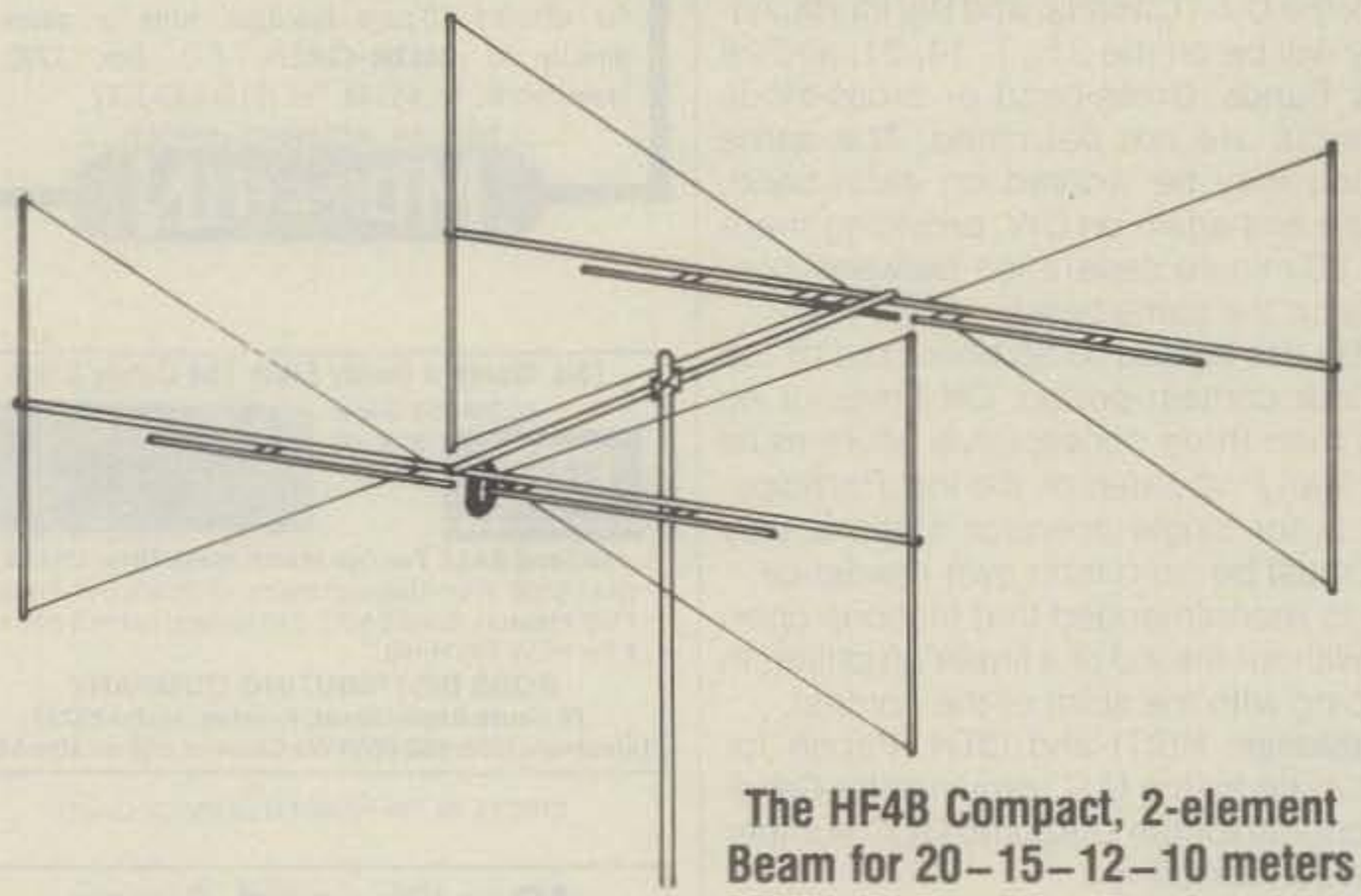

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Propagation

a monthly feature by
GEORGE JACOBS, W3ASK

THE SCIENCE OF PREDICTING RADIO CONDITIONS

Thirty-Fifth Anniversary

I became Propagation Editor for *CQ* magazine during March 1951 and my first column appeared in that month's issue. I succeeded my good friend the late Perry Ferrell, who inaugurated propagation forecasts specifically tailored to the needs of radio amateurs with his Monthly DX Predictions, which first appeared in the June 1946 issue of *CQ*.

Since March 1951 this column has appeared continuously, month after month, under my byline. It has been written by me on five continents and in over two dozen countries from the Arctic Circle of Scandinavia to the jungles of Peru, and within the sound of armed conflict in the Middle East and Southeast Asia. Whatever the situation, there was my crystal ball and typewriter, and a deadline never missed.

Reckoned in terms of sunspot cycles, my editorship of this column extends from the middle of Cycle 18 to what now appears to be the final months of Cycle 21. With the start of a new sunspot cycle on the near horizon, there are a great number of interesting propagation events coming up in the years ahead on the HF bands. I am looking forward to continuing to report them to you here on the pages of *CQ*.

As I begin my 36th year as Editor of this column I want to pay special tribute to the editors and publishers of *CQ*, who had the foresight and the understanding to bring propagation predictions and forecasts to the pages of *CQ*.

WW DX Contest Critique (CW)

The 1985 CW section of the *CQ* World-Wide DX Contest was held during the weekend of November 23 and 24. The geophysical parameters that were examined in making the forecasts for this contest weekend and which appeared in this column for November and December all pointed to quiet geomagnetic conditions and generally High Normal HF propagation conditions. Nature again cooperated magnificently.

Solar activity, as measured by the 2.8 GHz solar flux level, reached 75 on November 23 and 74 on the 24th. While not quite as high as the levels recorded during the October phone section of the contest, these were nevertheless somewhat higher than generally would be expected during this period of low solar activity. Geomagnetic conditions, as measured by the international A-index, ranged between 5 and 6 on the 23rd and 4 and 5 on the 24th. These are indicative of quiet geomagnetic conditions. This combination of solar flux and geomagnetic indices produced High Normal ionospheric conditions during the CW contest weekend, much as forecast in this column. In fact, KH6BZF, the dean of propagation analysts, officially rated both days in that category, and initial reports received from contest participants appear to bear this out. While the 10 meter band may not have opened as well as it did during the phone section, daytime conditions appear to have been exceptionally good on *20*, *15*, and to some degree *10* meters. Nighttime conditions were good, and at times exceptionally good on *40* and *80* meters, and generally so on *160* meters. All in all, conditions during both the phone and CW sections of the 1985 contest were considerably better than one might

11307 Clara Street, Silver Spring MD 20902

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for March 1986

	Expected Signal Quality			
Propagation Index	**(4)**	**(3)**	**(2)**	**(1)**
Above Normal: 8, 14, 26	**A**	**A**	**B**	**C**
High Normal: 3, 7, 13, 16, 24, 27	**A**	**B**	**C**	**C-D**
Low Normal: 1-2, 6, 9, 12, 15, 17-18, 21-23, 25, 28-29	**A-B**	**B-C**	**C-D**	**D-E**
Below Normal: 4-5, 19-20, 30-31	**B-C**	**C-D**	**D-E**	**E**
Disturbed: 10-11	**C-E**	**D-E**	**E**	**E**

Where expected signal quality is: **A—Excellent opening, exceptionally strong, steady signals greater than S9.**

B—Good opening, moderately strong signals varying between S6 and S9, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S3 and S6, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and S3, and with considerable fading and noise.

E—No opening expected.

HOW TO USE THIS FORECAST

1. **Find *propagation index* associated with particular band opening from Propagation Charts appearing on the following pages.**
2. **With the *propagation index*, use the above table to find the expected signal quality associated with the band opening for any day of the month. For example, an opening shown in the charts with a *propagation index* of 3 will be fair-to-good (B-C) on March 1st and 2nd, good (B) on the 3rd, fair-to-poor (C-D) on the 4th and 5th, fair-to-good (B-C) on the 6th, etc.**

HOW TO USE THE SHORT-SKIP CHARTS

1. In the Short-Skip Chart, the predicted times of opening can be found under the appropriate distance column of a particular Meter band (10 through 160 Meters) as shown in the left hand column of the Chart. For the Alaska and Hawaii Charts the predicted times of openings are found under the appropriate Meter band column (10 through 80 Meters) for a particular geographical region of the continental USA as shown in the left hand column of the Charts. An * indicates the best time to listen for 80 meter openings.

2. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. On the Short-Skip Chart, where two numerals are shown within a single set of parenthesis, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. The index indicates the number of *days* during the month on which the opening is expected to take place, as follows:

(4) Opening should occur on more than 22 days
(3) " " " between 14 and 22 days
(2) " " " between 7 and 13 days
(1) " " " on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual *dates* on which an opening with a specific *propagation index* is likely to occur, and the signal quality that can be expected.

3. Times shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M., 13 is 1 P.M., etc. On the Short-Skip Chart appropriate *standard* time is used at the *path midpoint*. For example on a circuit between Maine and Florida, the time shown would be EST, on a circuit between N.Y. and Texas, the time at the midpoint would be CST, etc. Times shown in the Hawaii Chart are in HST. To convert to standard time in other USA time zones *add* 2 hours in the PST zone; 4 hours in the MST zone; 3 hours in the CST zone, and 5 hours in the EST zone. *Add* 10 hours to convert from HST to GMT. For example, when it is 12 noon in Honolulu, it is 14 or 2 P.M. in Los Angeles; 17 or 5 P.M. in Washington, D.C.; and 22 GMT. Time shown in the Alaska Chart is given in GMT. To convert to *standard* time in other areas of the USA *subtract* 8 hours in the PST zone; 7 hours in the MST zone; 6 hours in the CST zone and 5 hours in the EST zone. For example, at 20 GMT it is 15 or 3 P.M. in N.Y.C.

4. The Short-Skip Chart is based upon a transmitted power of 75 watts c.w. or 300 watts p.e.p. on sideband; the Alaska and Hawaii Charts are based upon a transmitter power of 250 watts c.w. or 1 kw p.e.p. on sideband. A dipole antenna a quarter-wavelength above ground is assumed for 160 and 80 meters, a half-wave above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 db gain above these reference levels, the *propagation index* will increase by one level for each 10dB loss, it will lower by one level.

5. Propagation data contained in the Charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Dept. of Commerce, Boulder, Colorado, 80302.

Say You Saw It In CQ

CQ Short-Skip Propagation Chart
March & April, 1986
Local Standard Time At Path Mid-Point

Band (Meters)	Distance 50-250	Between 250-750	Stations 750-1300	(Miles) 1300-2300
10	Nil	Nil	08-19 (0-1)	08-14 (1-0) 14-16 (1) 16-19 (1-0)
15	Nil	08-21 (0-1)	08-12 (1) 12-17 (1-2) 17-21 (1) 21-08 (0-1)	08-10 (1) 10-13 (1-2) 13-14 (2) 14-16 (2-3) 16-17 (2) 17-18 (1-2) 18-19 (1) 19-20 (1-0)
20	Nil	08-12 (0-2) 12-16 (0-3) 16-18 (0-2) 18-08 (0-1)	06-08 (1-2) 08-09 (2) 09-10 (2-3) 10-12 (2-4) 12-16 (3-4) 16-18 (2-4) 18-19 (1-3) 19-21 (1-2) 21-06 (1)	06-08 (2-1) 08-09 (2-3) 09-10 (3) 10-15 (4-3) 15-18 (4) 18-19 (3) 19-20 (2-3) 20-21 (2) 21-05 (1-0) 05-06 (1)
40	07-09 (0-1) 09-10 (0-2) 10-12 (2-4) 12-16 (3-4) 16-18 (2-3) 18-20 (1-2) 20-22 (0-1)	06-07 (0-2) 07-08 (1-2) 08-10 (2-3) 10-15 (4-3) 15-16 (4) 16-18 (3-4) 18-20 (2-3) 20-22 (1-2) 22-06 (0-1)	06-08 (2) 08-15 (3-1) 15-16 (4-2) 16-18 (4-3) 18-20 (3-4) 20-22 (2-4) 22-00 (1-3) 00-06 (1-2)	06-08 (2-1) 08-15 (1-0) 15-16 (2-0) 16-17 (2-1) 17-18 (3-2) 18-21 (4-3) 21-22 (4) 22-00 (3-4) 00-02 (2-3) 02-06 (2)
80	08-11 (3-4) 11-18 (4) 18-20 (3-4) 20-22 (2-3) 22-00 (1-2) 00-06 (1) 06-08 (1-2)	08-11 (4-1) 11-16 (4-0) 16-18 (4-2) 18-20 (4-3) 20-22 (3-4) 22-00 (2-4) 00-06 (1-2) 06-08 (2)	06-08 (2-1) 08-11 (1-0) 11-16 (0) 16-18 (2-1) 18-20 (3-2) 20-00 (4) 00-05 (2-3) 05-06 (2)	06-08 (1-0) 08-16 (0) 16-18 (1-0) 18-20 (2-1) 20-22 (4-2) 22-00 (4-3) 00-05 (3) 05-06 (2-1)
160	05-07 (4-2) 07-09 (3-1) 09-17 (2-0) 17-19 (3-1) 19-20 (4-2) 20-05 (4)	05-06 (2-1) 06-07 (2-0) 07-09 (1-0) 09-17 (0) 17-19 (1-0) 19-20 (2) 20-22 (4-3) 22-03 (4) 03-05 (4-3)	05-06 (1) 06-19 (0) 19-20 (2-1) 20-22 (3-2) 22-03 (4-3) 03-05 (3-2)	05-06 (0-1) 06-19 (0) 19-20 (1-0) 20-22 (2) 22-03 (3-2) 03-05 (2-1)

ALASKA
Openings Given In GMT#

To:	15 Meters	20 Meters	40 Meters	80 Meters
Eastern USA	21-23 (1)	21-23 (1) 23-01 (2) 01-02 (1)	06-13 (1)	07-12 (1)
Central USA	21-00 (1)	21-23 (1) 23-02 (2) 02-04 (1)	06-14 (1)	07-13 (1)
Western USA	19-21 (1) 21-23 (2) 23-01 (1)	19-21 (1) 21-23 (2) 23-01 (3) 01-03 (2) 03-05 (1)	06-08 (1) 08-12 (2) 12-15 (1)	07-10 (1) 10-13 (2) 13-15 (1) 10-14 (1)*

HAWAII
Openings Given In HST#

To:	15 Meters	20 Meters	40 Meters	80 Meters
Eastern USA	08-12 (1) 12-14 (2) 14-16 (1)	04-06 (1) 06-08 (2) 08-12 (1) 12-14 (2) 14-16 (3) 16-18 (2) 18-20 (1)	18-19 (1) 19-21 (2) 21-00 (3) 00-02 (2) 02-03 (1)	19-21 (1) 21-00 (2) 00-02 (1) 22-01 (1)*
Central USA	08-12 (1) 12-15 (2) 15-17 (1)	04-06 (1) 06-08 (2) 08-12 (1) 12-14 (2) 14-17 (3) 17-19 (2) 19-21 (1)	18-19 (1) 19-21 (2) 21-01 (3) 01-04 (2) 04-05 (1)	19-21 (1) 21-01 (3) 01-02 (2) 02-03 (1) 22-02 (1)*
Western USA	12-14 (1)** 07-09 (1) 09-10 (2) 10-14 (3) 14-16 (2) 16-18 (1)	03-04 (1) 04-07 (2) 07-10 (4) 10-13 (3) 13-16 (4) 16-17 (3) 17-19 (2) 19-21 (1)	17-19 (1) 19-20 (2) 20-23 (4) 23-05 (3) 05-06 (2) 06-07 (1)	19-20 (1) 20-21 (2) 21-04 (3) 04-05 (2) 05-06 (1) 20-00 (1)* 00-03 (2)* 03-04 (1)*

#See explanation in "How To Use Short-Skip Charts" in box at the beginning of this column.
*Indicates best time for 160 Meter openings.
**Indicates best time for 10 Meter openings.
Note: The Alaska and Hawaii Propagation Charts are intended for distances *greater* than 1300 miles. For shorter distances, use the preceding Short-Skip Propagation Chart.

have expected during a minimum phase of solar activity.

March Conditions

Prof. A. Koeckelenbergh of the Sunspot Index Data Center at the Royal Observatory of Belgium, the world's official keeper of sunspot records, reports a monthly mean sunspot number of 17 for November 1985. This results in a *12-month running smoothed sunspot number*, upon which the sunspot cycle is based, of 18 centered on May 1985. The present cycle is running pretty much on course towards a minimum value which is expected to occur late this year. (See "Progress of Cycle 21," *CQ*, December 1985, page 114). A smoothed sunspot number of 10 is forecast for March 1986.

Spring and fall are called the *equinoctial* seasons. These are the times when the sun is most nearly overhead at the equator, making night and day of almost equal length in all parts of the world. On March 21st and September 22nd the sun is *directly* over the equator, and the length of night and day is exactly equal.

The vernal, or spring, equinoctial period in the northern hemisphere has a noticeable influence on HF propagation conditions for a period of several weeks lasting from late February through late April. The effects of the autumnal, or fall, equinoctial period are felt from early September through late October.

During equinoctial period it is always spring in one hemisphere and fall in the other. This tends to create an ionosphere of more similar characteristics throughout the world than is possible during other times when it is summer in one hemisphere and winter in the other, and there are extreme differences in the ionosphere. It is this "ionospheric equalization" which takes place during the equinoctial periods that is responsible for optimum DX conditions.

An improvement in DX propagation conditions is usually most noticeable on the long circuits between the northern and southern hemispheres; for example, from the USA to Australia, South America, southern Africa, southern Asia, Antarctica, etc. Look for these openings during this coming month on the HF bands.

The best bands for DX propagation during March are expected to be *15* and *20* meters during most of the day, *20* and *40* meters during the early evening, and *40* and *80* meters during the hours of darkness and the sunrise period. Check *160* meters during the hours of darkness, and when conditions are High Normal, or better, check *10* meters for openings during the daylight hours. For more specific information, refer to the DX Propagation Charts which appeared in last month's column. This month's column contains Short-Skip Propagation Charts which are valid for both March and April, as well as Propagation Charts centered on Alaska and Hawaii. The Short-Skip Charts contain band-opening forecasts for predominantly one-hop paths, ranging in distances between approximately 50 and 2300 miles.

For day-to-day changes in HF propagation conditions expected during March, see the Last Minute Forecast, which appears at the beginning of this column.

VHF Ionospheric Openings

The possibilities for ionospheric openings on the VHF bands usually improve during March and the spring months.

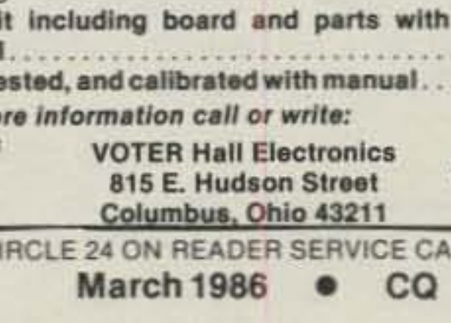
A seasonal increase in short-skip openings due to sporadic-*E* propagation generally takes place during March, and an occasional *6* meter openings may be possible by this mode during the month. Sporadic-*E* openings and most often occur during the daylight hours, over distances between approximately 1000 and 1400 miles.

Auroral activity often peaks during March, especially during periods when HF conditions are below normal or disturbed.

Not much meteor activity is expected during March, but some might be possible for very brief periods during minor showers that may occur March 14–15 and 24–25.

73, George, WA3ASK

REPEATER VOTER



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Antennas & Accessories

a monthly feature by
KARL T. THURBER, JR., W8FX

A LOOK AT THE SHACK FROM BOTH ENDS OF THE COAX

Reliable Communications Range

Line-of-sight considerations cramping your operating style on the higher bands? As columnist Thurber points out, there's more to the determination of the LOS and "real" operating range than at first meets the eye. —K2EEK

Last time we got together we discussed the many sources of hamshack information you're likely to find useful. We talked about various magazines, reference books, newsletters, specialized publications, and other sources. We also looked at some interesting contemporary hamshack reading material, and we introduced several new software offerings, including some inexpensive public-domain sources. We also took note of antenna and antenna parts suppliers.

This month we'll take a look at practical communications range considerations, factors you'll need to think about when predicting your "real" communications horizon. We'll again head for the bookshelf for some notes on new and interesting hamshack publications, and we'll again discuss some new radio software. We'll also punch out some "short bursts" on miscellaneous topics, space permitting.

Practical Antenna Horizons

It's common knowledge that at VHF and upwards, the higher you place your antenna, the greater the operating range of your station, other factors remaining the same. Antenna height is the most important factor in determining range when just optics are considered, but there are other factors, as well. In this column we'll look at antenna height and what it means in terms of the optical and radio horizon, as well as some of the other factors that go into the bottom-line operating range, such as transmitter gain (itself made up of several factors) and path loss.

Basic two-way communications on VHF and UHF are generally by means of the space wave, which is made up of the direct ray which travels directly from the transmitting antenna to the receiving antenna, and a ray which is reflected from the ground, which combine to produce the actual signal received. Though interaction between the reflected and direct rays can influence reception, we'll ignore reflection and refraction effects in discussing line of sight (LOS).

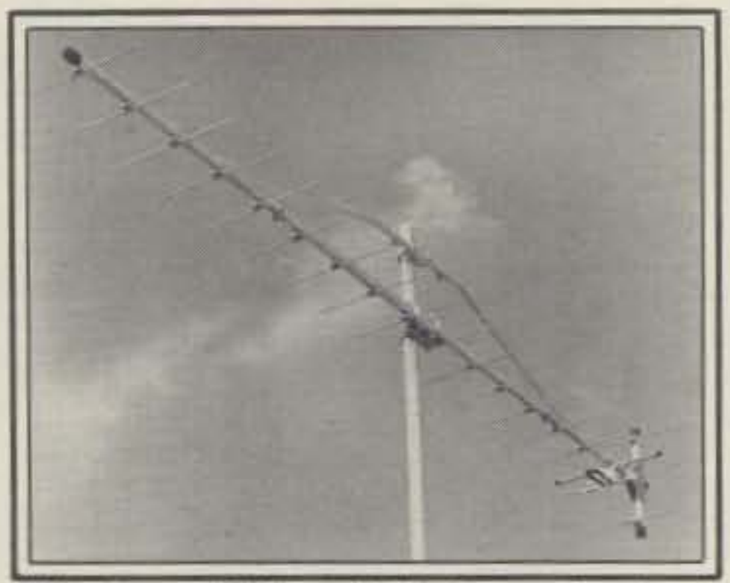
317 Poplar Drive, Millbrook, AL 36054

VHFers and UHFers are constantly concerned with the LOS limitations imposed by antenna height restrictions. A little trigonometry, which we won't detail here, allows us to calculate the LOS, which for the purpose of this discussion will be used synonymously with the optical horizon distance. The optical horizon distance is best seen in Table I; these figures assume an average terrain and no obstructions in the path.

Also included in Table I are the radio horizon distances for various antenna heights. The latter figures represent a 33% additional distance over the optical horizon distance. This coverage bonus is the result of diffraction, a phenomenon in which radio waves tend to bend around solid objects as they pass the edge of the obstacle.

This table was created with the transmitting station, such as a repeater, in mind, with the height of the receiving antenna assumed to be at ground level. For a realistic determination of the optical or radio horizon when the receiving antenna is elevated, your own "horizon" must also be calculated, and the result added to the table. Thus, the communications distance is equal to the sum of the horizon distances for both antennas. Naturally, the result assumes average terrain, with no untoward obstructions in the signal path that would block transmission. For the most part, the same polarization should be used on both ends of the path, as mixed polarization can result in signal degradation of 20 dB or more.

As is well known, it's not too difficult to work reliably beyond the calculated optical and radio horizons, even without the influence of special propagation conditions involving tropospheric ducting, skywave, sporadic-*E*, aurora, or the like. A number of factors, most of which are under your control, go into the bottom-line reliable communications range that results in signal reception well beyond the horizon.



What's my VHF or UHF "operating horizon," and if I want to work further or with greater signal reliability, what's the tradeoff between more antenna gain, a higher power, or a taller tower? The insights provided in this month's column should help to analyze the tradeoffs involved. (Photo courtesy Cushcraft Corp.)

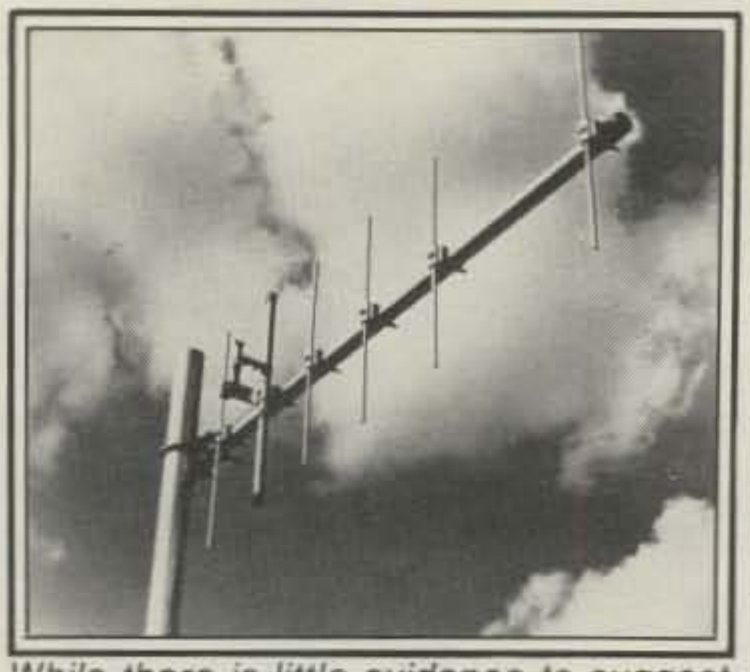
Several mathematical approaches to the precise calculation of reliable communications range have been proposed. One of the simplest to understand and use was proposed by L.W. Bray, K2LMG, in his November 1961 *QST* article "A Method of Determining VHF Station Capabilities." Bray's method of calculation groups the factors into two major classes

Ant Height (feet)	Optical Horizon	Radio Horizon	Ant Height (feet)	Optical Horizon	Radio Horizon	Ant Height (miles)	Optical Horizon
20	5.48	6.33	150	15.01	17.33	o 100	881
30	6.71	7.75	175	16.21	18.72	r 150	1074
40	7.75	8.95	200	17.33	20.01	b 200	1233
50	8.66	10.01	aircraft			i 300	1496
60	9.49	10.96	1000	39	45	t 400	1710
70	10.25	11.84	2000	55	63	500	1894
80	10.96	12.66	5000	87	100	750	2267
90	11.62	13.42	10000	123	142	1000	2560
100	12.25	14.15	20000	173	200	moon	
125	13.70	15.82	30000	212	245	240000	6161

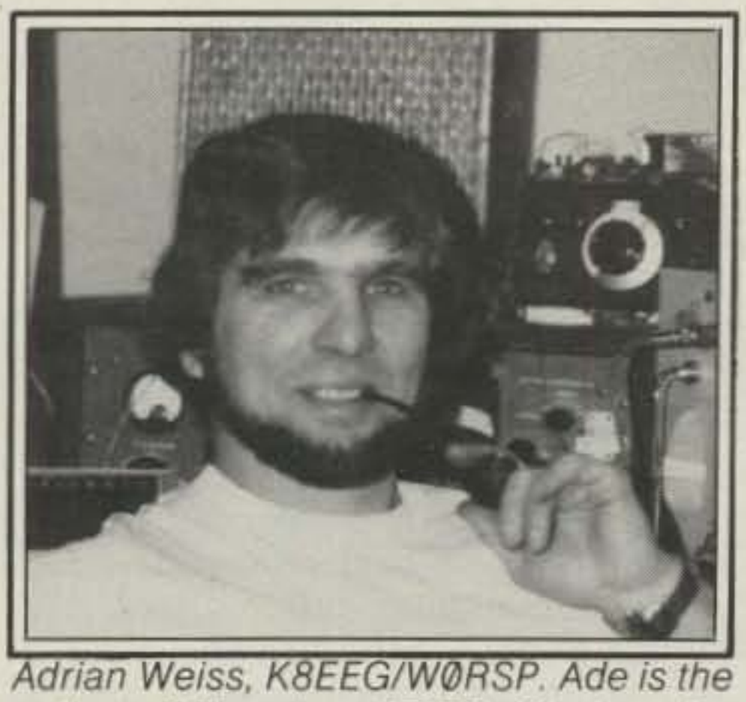
Based on formulas found in the *ARRL Antenna Book* the above table was prepared. These figures assume flat, open terrain. To determine if two stations can "see" each other, add the horizon distances for both stations and compare this to distance measured on a map. Horizons are in miles.

Table I– Optical and radio horizon distances. The table above shows both optical and radio horizon distances for typical antenna heights of 20–200 feet, aircraft altitudes of 1000–3000 feet, and orbital altitudes beginning at 100 miles. (Note the moon at 240,000 miles!) (Table was prepared by the Minn-Dak Sunflower Chapter of the 10-x International Net, Inc., printed in the Fall 1984 issue of 10-10 International News. *Permission to reprint is automatically granted, provided that suitable credit is shown.)*

Say You Saw It In CQ



While there is little evidence to suggest that either horizontal or vertical antenna polarization is "better" than the other at VHF and UHF frequencies, it is important to use the same polarization on "both ends" of the signal path. A circuit loss of 20 dB or more is possible with mixed (cross) polarization. There is some evidence, however, that over very short paths, higher signal levels are produced using horizontal polarization in some kinds of terrain. (Photo courtesy Cushcraft Corp.)



Adrian Weiss, K8EEG/WØRSP. Ade is the author of The Joy of QRP: Strategy for Success, *and has been CQ's QRP columnist since 1974. He is the founder of* The Milliwatt: National Journal of QRP. *Ade's primary interests in amateur radio include solid-state design, propagation and DXing, and working other QRPers. (Photo courtesy K8EEG/WØRSP)*

—station gain and path loss. The former, in turn, consists of factors having to do with station capabilities on both ends of the path: receiver sensitivity (the most important one), transmitted power, receiving antenna gain, receiving antenna height gain, transmitting antenna gain, transmitting antenna height gain, and signal-to-noise ratio. The path loss represents the decrease in power suffered by the signal as it is transmitted from one point to another, being expressed in dB. This path loss may be expressed in terms of communications reliability, and is usually stated for either 50% or 99% reliability. For most amateur work the 50% path loss level is used in calculations.

Bray's landmark work is reprinted in recent editions of the *ARRL Antenna Book*, and is made easily workable using a set of easy-to-use nomograms. One can add together all the various positive and negative factors to get the overall station gain, then couple this with the path loss using a nomogram, to find the expected reliable communications range. It's also possible to work with the problem from another perspective: starting with the path loss (which we can't do much about anyway), and then figuring out station changes that are necessary to overcome the "known" path loss. These changes might include increasing output power, elevating the antenna or increasing its gain, or using a lower-loss transmission line—and may involve various tradeoffs among these determinants of station gain.

Because these factors involve tradeoffs and "what-if's," they lend themselves very well to computer solution. Such an approach can simplify calculations and help you to decide what changes, if any, to make in your station to improve its range. Writing in the July 1985 issue of *Ham Radio*, Lynn A. Gerig, WA9GFR, in his article "Trade Off Power for Antenna Gain at VHF?" utilized much the same station and path-loss factors we discussed in constructing a calculation program for the Commodore 64 and Texas Instruments TI 99/4A computers. His propagation curves are based directly on selected ESSA curves described in a 1969 Institute for Telecommunication Sciences Technical Report, and they are set up to provide range over average terrain for which communications can be expected 50% of the time.

Using WA9GFR's programs, it is very easy to see the interrelationships between the various elements that make up station gain, and their impact on reliable communications range. This ability is especially useful in determining changes in anticipated range as a result of modifications to receivers, antennas, transmission lines, and transmitters.

If you don't have the original *H-R* issue, or don't want to type in the program, Lynn will make the Commodore 64 version available by sending him a blank tape or formatted disk with a stamped, self-addressed mailer and $5. The mailer should be sent to him at R. R. #1, Monroeville, IN 46773. A similar, shorter program for the unexpanded Vic-20, but in a ground-to-ground version only, is also available. For those who own TI-99/4A computers, this version is available from Lynn's associate, Joe Hennel. The program may be obtained by sending Joe a blank tape (no disks) and $5.00. Joe's address is 4316 Winston Drive, Ft. Wayne, IN 46806.

Good Hamshack Reading

The Joy of QRP: Strategy for Success. What does English Renaissance literature and flea-power hamming have in common? I'm not sure, but clearly Adrian ("Ade") Weiss, K8EEG/WØRSP, has struck a good balance in his recently published paperback book, which constitutes a mini-handbook on most aspects of QRP operation.

Ade is an interesting gent, one who has great enthusiasm for QRP, and he's the former publisher of *The Milliwatt: National Journal of QRP*. He also serves as *CQ*'s QRP Editor, and has done so since 1974. Solid-state design, propagation and DXing, and working other low-power enthusiasts are Ade's chief interests in amateur radio. He is a college prof, holding a Ph.D in English Renaissance Literature, and derives his greatest professional satisfaction from researching and teaching Shakespeare's dramas.

The new book consists of 151 pages in 8 chapters devoted to the most important aspects of QRP operation. Some of the major topics covered include the various types of QRP activity, planning for QRP operation, commercial equipment selection, homebrewing rigs, operating techniques, and RF power measurement.

Ade's book covers some of the special problems and concerns facing the QRPer. Chapter 8, for example, is dedicated to discussion of RF power measurements. This is particularly important since measuring power at flea-power levels is not an easy task, as most commercial power measuring instruments are designed for much higher power applications. He also describes ways to reduce the power of commercial transmitters to milliwatt levels. And, while there is no specific chapter on antennas, these are nevertheless covered in general in Chapter 3, Planning for QRP Operation.

Interestingly, *The Joy of QRP* is a small portion of a much larger typescript that is on the way to future publication. This is *The QRPer's Guide to Transmission Lines, Antennas, Propagation and DXing*. This book is intended to be a detailed, comprehensive examination of ionospheric propagation and its effects on QRP operation, with special emphasis on DXing. Another of Ade's projects is publication, with Christopher Page, G4BUE, of *The History of QRP, 1924–1926*, the story of the QRP "way of life" in the very early days of amateur radio.

Ade's book (ISBN 0-9614139-0-5) is available for $10.95 (US) or $11.95 (foreign) from Milliwatt Books, 833 Duke St., No. 83, Vermillion, SD 57069.

Antenna Compendium. Most antenna enthusiasts are familiar with that standard hamshack reference, *The ARRL Antenna Book*. But there is another ARRL publication that "rounds out" what the "standard" publication offers. This is *The ARRL Antenna Compendium*, which contains a collection of previously unpublished antenna articles. These are good articles, but ones which, due to space limitations in *QST*, could not be published. The 1985 book has 178 pages fairly packed with new material on quads,

loops, beams, verticals, reduced size antennas, SWR and loading, baluns, polarization, and several unusual antennas, to name but a few topics covered. The paperbound book is $10 in the US and $11 elsewhere. So if you want to learn more about Old Spruce, the LARAE, the crossed loop/goniometer, and the W8JF Waveram, this is clearly the book for you!

Computer Smyth. This is a new, hardware-oriented magazine for the technically sophisticated computer enthusiast who enjoys building, customizing, and exploring microcomputer hardware at the chip and board level. While not specifically geared for the computer-owning amateur radio operator, it's nevertheless oriented toward the "craftsman computerist" who doesn't mind taking the back off of his computer's case. The magazine is, really, the hardware equivalent of sophisticated software-oriented publications such as *Microsystems* and *Doctor Dobb's Journal*.

Subs are $15 for a year. Contact Computer Smyth Magazine, P.O. Box 176, Peterborough, NH 03458.

Electronic Systems Newsletter. Another new publication is this monthly, which focuses on the design, construction, and troubleshooting of computers and other electronic devices. The magazine covers new products and techniques in computers and electronics; source listings for products, components, and services; visual display systems; robotics, home security systems; and more. The magazine also specializes in information on turning hobby electronics and computer applications into profit-making business ventures.

A one-year newsletter subscription is $22. Contact AF Publishing Co., P.O. Box 524, So. Hadley, MA 01075.

Software of Note

Star 1.0. Star 1.0 is a low-cost but comprehensive personal computer circuit design program for the technically inclined individual who wants to put his computer to work on something other than word-processing, finances, or RTTY communications.

The program is written for fast (machine language) analysis and optimization of antennas, matching networks, filters, amplifiers, oscillators, hybrids, and other electronic circuits. The package enables frequency domain analysis of circuits using scattering parameters, optimization of circuit component values, and stability analysis of active circuits. Circuit descriptions and data may be stored as disk files for future reference, modification, or use. The program features output to screen or printer, and tabular or graph format outputs can be produced. (Fig. 1 shows an example printed graph, in this case a crystal filter being analyzed by the program.)

Star 1.0 is available for several computers, including the IBM-PC series, Apple series, Kaypro (CP/M 2.2 MBasic), and Commodore 64; a Macintosh version is under consideration. The program is furnished with a 78-page users manual, plus supplementary information for the particular computer version. The program disk also includes about 30 example circuit files, which are explained in the manual. Cost is $89 to $99, depending on the computer version. Randy Rhea, N4HI, Circuit Busters' proprietor, suggested that I mention that the program is primarily for professional circuit designers. Such users should experience little problem in working with the program, but others might find it somewhat difficult to use.

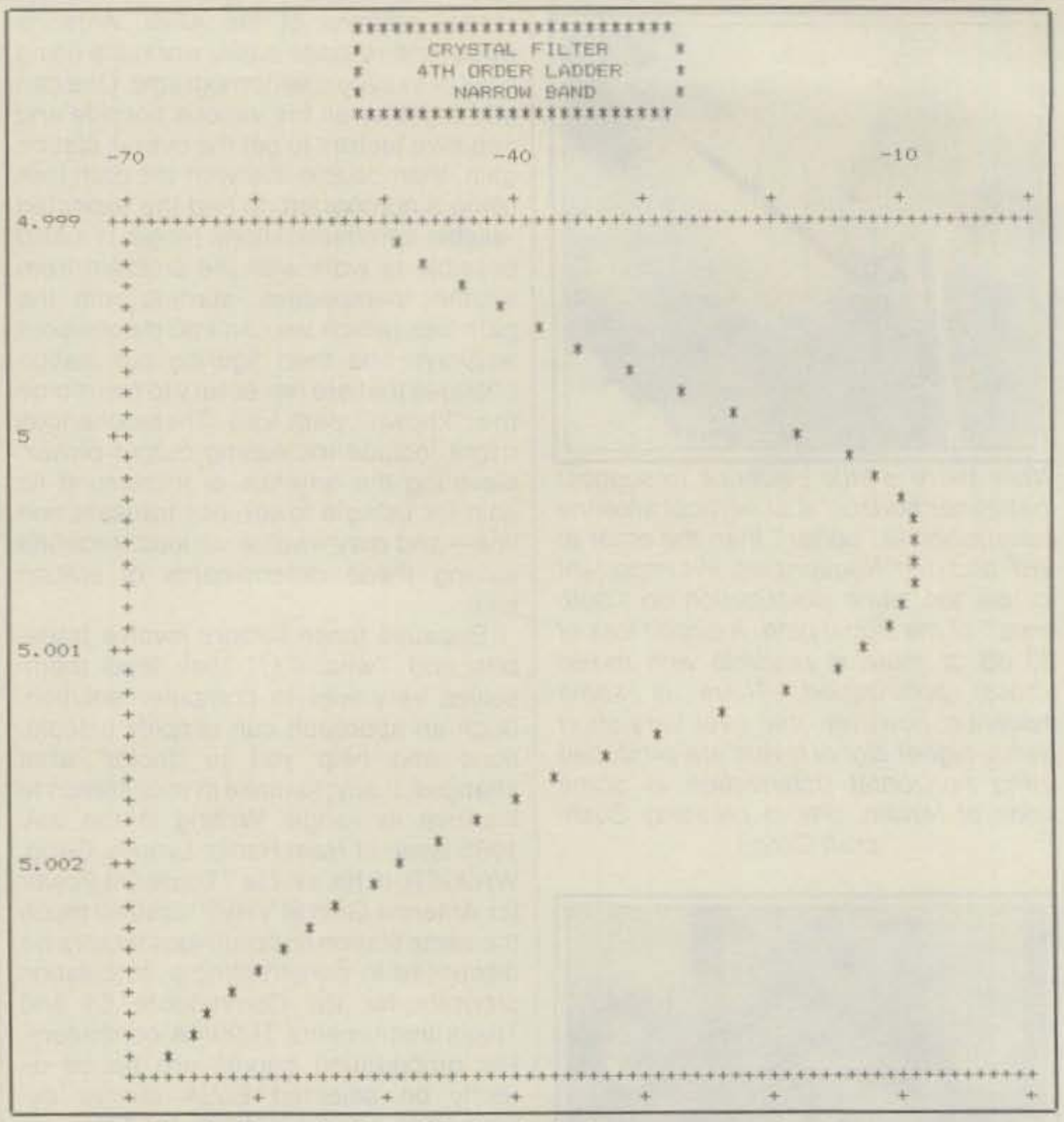


Fig. 1– Example Star 1.0 circuit design program printed output.

For more information—to take off on the popular 1984 movie hit, Who ya gonna call?—why, call the Circuit Busters, P.O. Box 256, Lilburn, GA 30247.

P.A.M. The disk-based Practical Applications Mathematics System for the Commodore 64 is offered by Micro-Energy Systems, P.O. Box 5291, High Point, NC 27262. In effect a sort of "mathematician's playground," the program has considerable application for calculating mechanical aspects of tower and antenna construction.

P.A.M. is designed to calculate the unknown dimensions of a number of different shapes such as the circle, square, rectangle, sector or segment of a circle, parallelogram, trapezium, circular ring, regular polygon, and others. The program also computes statistical functions, including linear regression and linear interpolation, with high-resolution plotting of points and the regression line. All geometric shapes are depicted in color on a high-resolution screen; conveniently, calculation results and graphics can be printed to paper. Also included is a base conversion system which will convert any base from 2 to 36. According to the company, the program makes a suitable learning tool for school applications, in addition to amateur radio and professional uses.

Apple Contest Programs. Jack Schultz, W2GGE, has advised us of a series of specialized contest logging programs custom-tailored for the serious contester. Jack's Apple program disks are available in separate, dedicated versions for the *CQ* World-Wide DX, ARRL DX, WPX, Sweepstakes, 160 Meter, Field Day, and Sprint contests.

While the specific programs are somewhat different to support the unique requirements of each contest, the programs feature high-speed operation; instant dupechecking; contest log keeping; automatic timekeeping; various QSO totaling updates; editing and printing

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functions; and QSL label generation, to name but a few features.

According to Jack, the programs are compatible with the Apple II, II +, IIe, and IIc. Various printers may be used, such as the BMC and Epson machines, though some customization of print routines may be required for use with other printers. The user can type in the time manually, if desired, and can also type out the log if he doesn't own a printer.

The W2GGE programs are available for $30 each. For more information, contact Jack L. Schultz, W2GGE, 2 Huxley Drive, Huntington, NY 11743.

BVE Engineering Professional Software. Some time ago we took brief note of the technical applications software offered by BVE Engineering. Their catalog #4 adds several new items to their growing line of technical software, and several computers are newly supported.

The current BVE catalog shows ten engineering software products, including offerings such as ACNAP, an electronic circuit analysis program; MATRIX MAGIC, a matrix manipulation and test program; PLOTPRO, a scientific graph printing program; and RIGHTWRITER, a proofreader and writing style analyzer which reportedly possesses an "artificial intelligence" of its own. A look at the list of currently supported systems shows over 70 computers and disk formats covered by the line of software—though not all programs are available for all computers, in all DOS versions or disk formats.

Interestingly, the firm now has something of a "test drive before you buy" program. Demo disks and a complete manual are available for most products for $5 per program, plus shipping. Because of the low price of the demos, they are not returnable, nor is credit offered toward purchase of the main program. Most of the programs described in their catalog are priced under $80.

For more details, contact BVE Engineering Professional Software, 2200 Business Way, Suite 207, Riverside, CA 92501.

TS2068 Morse Code Translator. In an earlier column we noted several individuals and firms which specialize in supporting the various Timex/Sinclair computers. One such firm is Thomson Software, P.O. Box 1266, Lombard, IL 60148.

One of Thomson Software's products which we mentioned then was the Morse Code Translator for the TS1000 computer. The firm now also sells a similar translator for the TS2068, which allows the user to receive Morse code through the computer's "ear" jack and scroll it across the display screen. The program will also generate code from characters typed in from the keyboard; included are instructions for wiring a simple reed relay interface between the computer and a code key. Incoming code can come from any source of adequate volume, clarity, and speed (8–60 wpm). Buffered keyboard entries can generate Morse from 5–100 wpm. From its description, the software seems to be most appropriate for code practice, rather than over-the-air work.

The TS2068 Morse Code Translator is available for $15.95 plus $1 shipping, while the translator for the TS1000 is $9.95.

Crumtronics Logging Programs. In a previous column we described the Commodore 64 logging systems from George W. Crummie, Jr., KA9DAH. George has "fleshed out" his product line to, in his words, "perfect the most complete and versatile logging system ever for the C-64." I would have to agree that George offers a rather comprehensive and sophisticated line of logging software, which represents a considerable refinement of the original Contender logging program, which itself was excellent.

Presently Crumtronics offers four major logging programs. These are the (1) Contender Plus II; (2) Contender Plus II/ with USA-CA; (3) County Hunter; and (4) CO/DE (Contest Organizer/Dupe Eliminator). Each is a highly specialized program, so it's worthwhile to point out their main capabilities here.

Contender Plus II is a full-feature logging program which can handle 2000 en-

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tries per disk, with 9 items per entry. Special features include edit and update capability; forward/reverse scan; partial/sorted or complete printouts; QSL cards or label generation; WAS, WAZ, DXCC summaries and reports; and dupe-checking—indeed a powerful program.

Contender Plus II/with USA-CA also includes an enhanced county record-keeping system. This system enables you to keep an accurate log of all 3075 counties in all 50 states. Counties may be logged manually or automatically using the data created by the basic logging program. A stand-alone version of the USA-CA program is available as County Hunter, which comes with the general logging program found in Contender Plus II (but without the WAZ and DXCC features).

CO/DE, or Contest Organizer/Dupe-Eliminator, is a fast, real-time dupe-checking contest logging system, one that is especially tailored for Field Day or other contest use where speed and accuracy of logging are required.

The various programs in the Contender series are priced from $29.95 to $49.95, depending on the specific program selected. They are available from Crumstronics, Inc., Software Division, P.O. Box 6187, Ft. Wayne, IN 46896.

Short Bursts

Beverage Update. In the August 85 column we discussed the venerable Beverage antenna. In an illustration which appeared on p. 97 we showed a practical Beverage installation in which we suggested the use of a 4:1 or 6:1 balun to match 50–75 ohm coax to the flattop. Craig Clark, N1ACH, dropped us a note suggesting that either a 9:1 or 12:1 transformer be used to match 50–75 ohm cable to the antenna, in place of lower-ratio transformers, for better results. He also indicated that use of a preamp is highly desirable. As we pointed out in that column, while the Beverage has received scant attention in the amateur press in recent years, it's still a popular antenna with low-frequency and medium-frequency (broadcast band) DXers, as well as 160 meter buffs.

Electronic Cottagers. Are you presently (or perhaps becoming) a work-at-home "telecommuter" person, doing writing, consulting, circuit design, financial work, or whatever from your home in lieu of the more familiar office environment? Without a doubt, such individuals are at the forefront of a new wave of change in the way Americans live and work.

It turns out that there is at least one organization for you if you are such a person. It's known as the AEC, the Association of Electronic Cottagers. Designed for the person who thrives in an "electronic cottage," the organization provides a support network for those who work at home full- or part-time in their own entrepreneurial business or for a salary. AEC provides a wide range of services, including on-line databases and a bulletin board via CompuServe, promotional and marketing support, and even group insurance. The AEC also has a tie-in with the *MicroMoonlighter* newsletter, and offers several books and publications to members, such as Paul and Sarah Edwards' reference guide, *Working at Home*.

Postscript: If you want to telecommute, to become a "cottager," there are those who would like to prohibit you from doing so. Labor unions oppose working at home with personal computers, and local zoning and licensing officials often look with disfavor on home offices. Cottager organizations, such as the AEC, undoubtedly perform a valuable function in keeping on top of the nay-sayers.

Wrapping It Up

This month we've examined several aspects of what constitutes reliable communications range, including the concepts of the optical and radio horizon; described several publications you may wish to place on your hamshack bookshelf; and discussed several new computer software offerings. We also had time for short notes regarding our August 85 discussion of the Beverage antenna, as well as an interesting organization for the telecommuter.

Next month we'll take a look at several new Antennas & Accessories topics of interest. See you then.

73, Karl, W8FX

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VHF

a monthly feature by
STEVE KATZ, WB2WIK

PRINCIPLES, PRACTICES, AND PROJECTS FOR THE VHFER

The Customers Always Write

Letters, we get letters, and I'm glad we do. It shows that people are reading the column, and correspondence gives us something to write about. I try to answer any direct inquiry, but enjoy printing readers' comments in the column, too. Here are some interesting tidbits accumulated over the past two months.

The K9MK/R repeater near Fort Worth, TX was probably the first "machine" on our new 33 cm (902–928 MHz) band. The system was built by members of the Motorola Amateur Radio Club, and has its transmitter output at 920 MHz, with its receiver input — 12 MHz, at 908. Credit for the major efforts behind this possible "first" goes to Bill Cantrell, WD5CVG, Greg Raven, KF5N, and Mike Krzystyniak, K9MK/5. The K9MK/R 920 MHz repeater uses converted Motorola commercial equipment and offers an "adaptive repeat" mode, where any number of preprogrammed inputs or the national simplex channel (906 or 906.5) can be repeated.

Mike, K9MK, says that the new repeater's coverage is quite good, not much different from 70 cm (440 MHz). The users are enjoying mobile coverage to about 20 miles, and occasionally to 40 miles, from the 50 watt ERP (effective radiated power) repeater. K9MK says he plans a four-part series on how to get going on 33 cm FM with readily available material, although he didn't say when or where he expects to publish this information. Mike did stress that no gear is available at this time from our friends across the Pacific (JA-land), and it is possible that none will be in the foreseeable future.

Speaking of 33 cm, SCRRBA, the rather famous Southern California Repeater and Remote Base Association (P.O. Box 5967, Pasadena, CA 91107) has adopted the first southern California 33 cm band utilization plan. SCRRBA has been influential in formulating repeater band plans which have become regionally—and even nationally—recognized in the past, so their decision could be important to us all. According to a recent SCRRBA newsletter, their meeting of November 16, 1985 featured representatives from all segments of the VHF community, including "weak signal DXers," ATV enthusiasts, digital (packet) users, mobile relay, point-to-point relay, and even our national amateur satellite group, AMSAT. Five separate sources of data on amateur and nonamateur users of the 33 cm band were used as inputs during the planning session. The outcome of SCRRBA's meeting shows careful consideration for all parties, and the adopted plan contains a "weak signal DX" window from 902–903 MHz, a digital communications allocation from 903–905 and 915–917 MHz, repeater channels occupying 905–909 and 917–921 MHz with 25 kHz channel spacing and 12 MHz input/output spacing, and an ATV "window" from 909–915 MHz with the video carrier centered at 910.25 and audio at 914.75 MHz.

24 Louis Dr., Budd Lake, NJ 07828

Here's station owner Ron Bussiere, N4KCM, seated in his comfortable shack. The large rack-panel gear in the background is Ron's 6 meter kilowatt amplifier.

The neat layout at N4KCM, Cynthiana, Kentucky. Ron uses an IC745 (HF), IC551D (50 MHz), IC251A (144 MHz), and IC471A (432 MHz). The 6 meter rig is followed by a homebrew kw amp using a pair of 3-400Z's, while the higher band rigs are connected to solid-state amplifiers.

For more information on the SCRRBA 33 cm band plan, write to them at the address shown above.

Canada's DOC (Department of Communications) has issued a proposal entitled "Restructuring of the Amateur Service" which indicates that they plan a new license class which would require only a basic written examination of regulations and operating skills —essentially, a no-code license intended to introduce newcomers, particularly youngsters, to amateur radio. Significant is the DOC's intention to allow all-mode communications with a maximum transmitter power of 250 watts input on amateur frequencies *above* 30 MHz for the new Class A (no-code) licensees. This is a progressive bit of thinking, in my opinion. Would similar FCC action in the U.S. create total havoc? I'd be interested to hear your views. This information is taken from the *W5YI Report*.

A.J. Harris, AA4FQ, of Utica, Kentucky reported on his success with Aurora work on November 29, 1985. Harris worked 5 new grids and 3 new states via 144 MHz Au, with best DX

Antennas are tall at N4KCM. The KLM 16LBX for 2 meters is alone on a 90 foot tower, while the pair of 30LBX's for 70 cm are stacked above Ron's modified Cushcraft A50-6 for 6 meters on a separate 90 foot tower.

of about 700 miles to W0EMX in EN21 and W0VB in EN34. A.J. says he heard VE3FN in Ottawa, Ontario (FN25) about 57A, but didn't complete a contact, which would have been 1000 miles from his EM67 location. AA4FQ runs only 21 watts output from a Kenwood TR9130 to a pair of homebrew quad antennas at 47 feet, fed with ½ inch hardline. With this modest setup A.J. has worked 64 grids and 23 states, once again proving that it doesn't take a kilowatt and a moonbounce array to work DX and have lots of fun on 2 meters. AA4FQ is planning an 8930 amplifier (this is similar to a 4CX250 tube) and a pair of Cushcraft Jr. Boomers to replace his weathered homebuilt antennas.

Ron Bussiere, N4KCM, of Cynthiana, Kentucky (this must be my month for letters from Kentucky) writes to tell us about his activities on 50, 144, and 432 MHz. Using the equipment shown in the photographs, Ron's been doing some excellent weak-signal work from his EM78 QTH. N4KCM's station looks a bit like an ICOM advertisement, but I'm sure the real secret to his success lies in his top-notch antenna installation: 6 elements on 6 meters, 16 elements (KLM 16LBX, a 28 foot long boom antenna) on 2 meters, and a pair of 30-element (KLM 30LBX) beams on 70 cm, all nice and high and in the clear.

Bussiere says that since cable TV came to the Lexington area, tall (used) towers are available for the asking! This is a great hint for anyone who lives in a relatively rural area which has only recently been served by a cable TV system. Of course, Ron has 25 acres

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over which to spread his antenna farm, but his system looks clean and unobtrusive, and his towers aren't far from his house. N4KCM says he has some good ideas for VHF enthusiasts, and he'd like to publish them. He's modified his Cushcraft A50-6 Yagi for improved performance, he's solved some difficult VHF noise problems, and he's designed a circuit to interface his IC551D 6 meter rig with his outboard power amplifier, a pair of 3-400Z's. Maybe we can start a "VHF Tips" section here, Ron. How would you like to be the first contributor?

Gene Shea, KB7Q, the publisher of the *2 Meter EME Bulletin,* is selling legal-limit amplifiers for 144 MHz. This is a sideline business, so the amps are made to order, but Gene's offering some very interesting systems. His "Configuration #1" is an RF deck kit which is supplied less the 8877 tube, blower, and power supply. The nice part is the price—only $395. The same kit supplied with the 8877 and blower is priced at $825, and this amplifier is available wired and tested, with tube and blower (minus power supply) for $975. Considering the list price of an 8877 (about $600), this seems a good deal to me. Gene is also offering a complete, "ready to go" system including wired and tested RF deck *and* mating power supply for $1595. I hope to have a review unit on hand sometime in January (this was written mid-December 1985), and will print the results of my evaluation in a forthcoming column.

KB7Q is planning to introduce a half-powered amplifier (800 watts output) using the Eimac 3CX800A7, and he intends to sell this as an RF deck kit, less tube and blower, for $325. The advantage to this smaller amp, of course, is the less costly tube and less bulky power supply required. Gene also offers subscriptions to his excellent monthly EME bulletin ($13/year, North America; $20/year, worldwide) and various operating accessories for the moonbounce enthusiast. For further information or a subscription to the *2 Meter EME Bulletin,* write to Gene at 417 Staudaher St., Bozeman, MT 59715.

William Itter, N9EWA, Public Relations Chairman for the Schaumburg Amateur Radio Club (P.O. Box 94251, Schaumburg, IL 60194) mailed us a news release regarding the "OSCAR Gateway: Chicago To The Coasts" established on November 7, 1985. Using the N9CXQ "NAPS" (Northwest Area Public Service) repeater and the home station of Paul Bocci, K9NO, 21 area amateurs were given the opportunity to experience satellite communications firsthand. At about 0220 UTC on November 8, the "Gateway" was activated and contact was made with N1DOA (in New Hampshire) who spoke with several Chicago area amateurs using handhelds, mobiles, and base stations via the OSCAR to N9CXQ repeater link. Later that evening contacts via the "Gateway" were established with KA2PRX in New Jersey and K6IBY in California. Since the NAPS repeater has inputs on both 2 meters and 70 cm, operators were free to use either 146 or 440 MHz equipment to access the "Gateway" system. Conversion from the N9CXQ repeater to the OSCAR 10 satellite was implemented by K9NO in Roselle, Illinois. Dick Beers, WD9IIC, AMSAT coordinator for northern Illinois, acted as net control for the demonstration.

This OSCAR "Gateway" concept should be of interest to all amateurs, especially VHFers and repeater owners who can offer our services to community groups in hopes of interesting more folks in the world of VHF/UHF. Nonamateurs with public-service monitors ("scanners") will probably be *really* curious about how all this works, and maybe "Gateways" will bring more newcomers to the hobby.

Product Review: The Microwave Modules MMT144/28R Transverter

Anyone who reads this column knows that yours truly is a proponent of linear transverters for VHF/UHF weak-signal work. Using even modest HF equipment for IF transmission and reception, a high-quality VHF transverter opens the door for exploration of a whole new and exciting world of amateur radio activities. A good HF station fitted with an accessory VHF transverter will generally outperform most VHF multimode transceivers, and the flexibility offered by such a setup will be appreciated with time.

The new and improved Microwave Modules 2 meter transverter model MMT144/28R. Photo by KT2B.

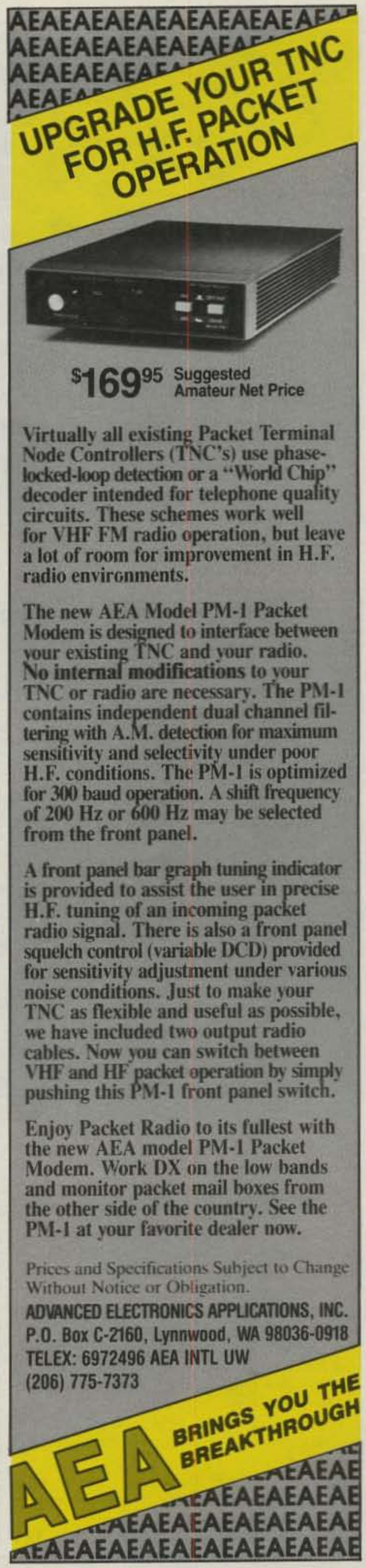
As an active VHFer, I try to spend some time using every new piece of commercially manufactured gear that enters the American market. Sometimes I purchase the new gear, but more often I borrow it; if I'm lucky, I'll borrow new equipment for use in a major VHF contest! This approach can backfire, since some of the newer gear does not perform as well as my "old" station equipment. As such, I always keep the "old" gear ready for backup service.

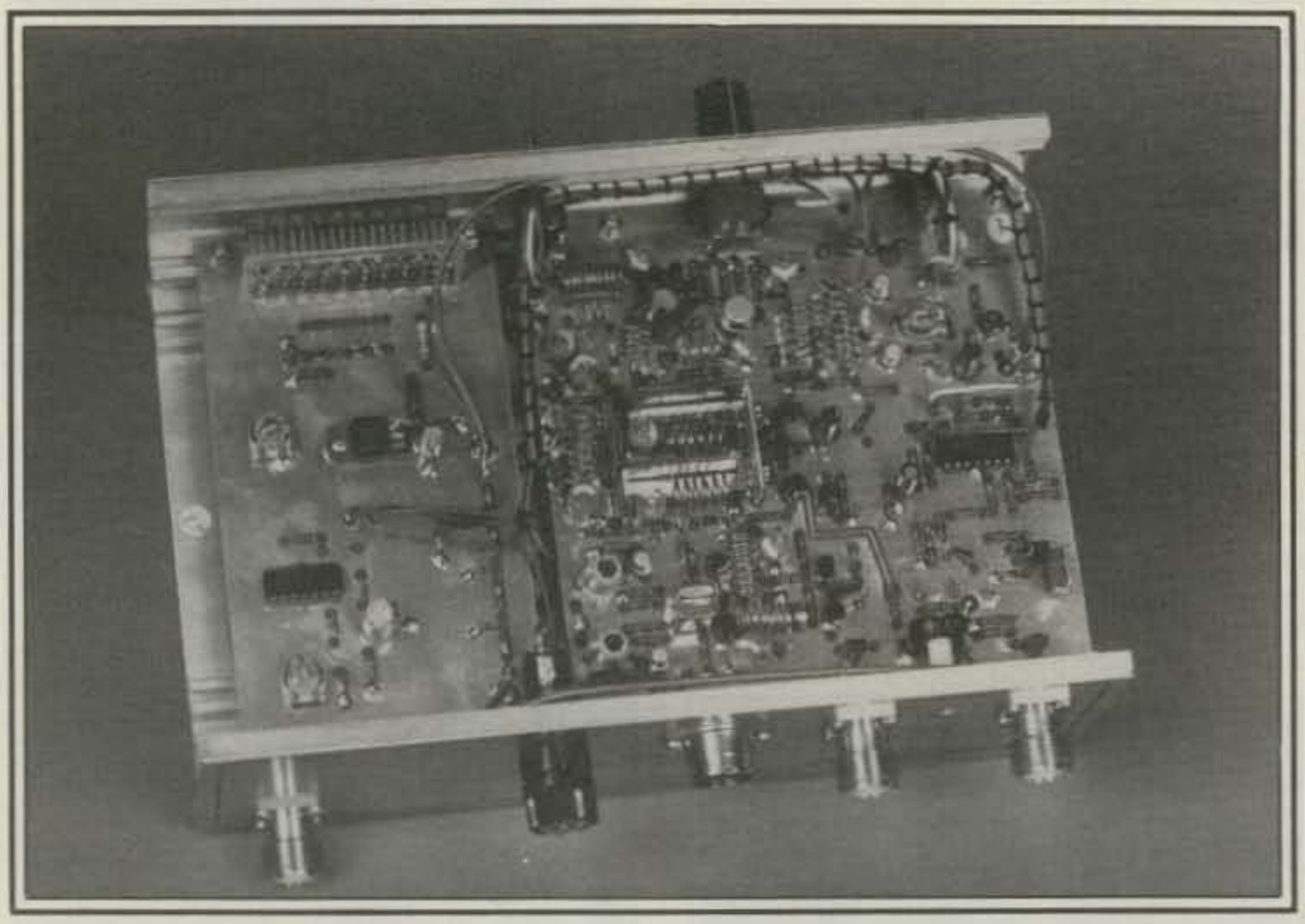
When I first heard of the Microwave Modules MMT144/28R in July 1985, I knew this was going to be one piece of equipment I'd keep for my permanent station use. The new "R" version transverter represents a drastic departure from the old "black boxes" imported to the U.S. since 1979. Manufactured by Microwave Modules Ltd., Brookfield Drive, Aintree, Liverpool, England, the new MMT144/28R product is a modern—I'd say state of the art—*multimode* linear transverter which converts 28 MHz equipment for operation on the 144–148 MHz band. Multimode? Yes! The new "R" transverter includes a factory-supplied, selectable frequency offset on transmit to allow its use through FM repeaters. Of course, your 28 MHz gear must be equipped for FM operation (simplex) for this function.

What, you may ask, makes this new model superior to the older but extremely popular MMT144/28 "black box" transverters? Well, the two products are entirely different, but I'll try to list some of the obvious advantages of the "R" series unit:

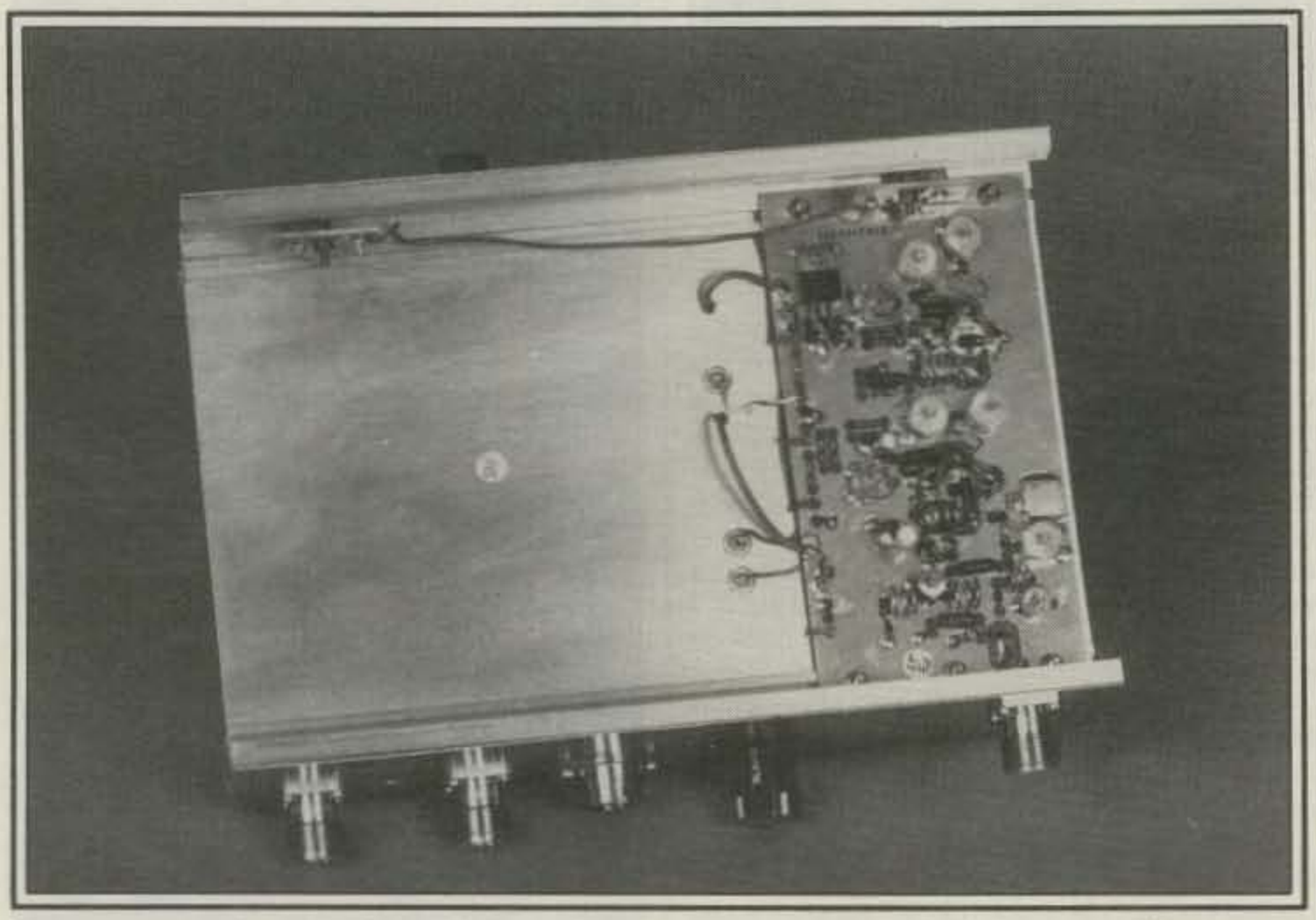
•25 watts rated output power (the old unit ran 10 watts).

•Increased sensitivity to 28 MHz drive on xmit—will develop full output power with much less than 1 mw drive level (the old unit required about 5 mw).





Inside top view of the MMT144/28R. The layout is neat and clean and easily serviced, more so than earlier models. Photos were taken prior to adding the separate 144 MHz RX input jack discussed in the text. Photos by KT2B.



The underside of the MMT144/28R contains only the transmitter's final power amplifier circuits. The large cross-section area of aluminum serves as both internal shielding and a heatsink for the final PA stages.

•GaAsFET RF stage driving a high-level doubly-balanced mixer on receive (the old unit used a dual-gate MOSFET driving a MOSFET mixer).

•Transmitter ALC circuit (the old unit had none).

•LED bargraph relative output indicator on xmit (the old unit had no indicators).

•Repeater shift function on xmit (the old unit had no offets).

•Variable delay RF VOX with push-to-talk override (the old unit had RF VOX, but no variable delay).

•Front-panel on/off power switch, plus "power" and "xmit" indicators (the old unit had no switch or indicators).

•Rear-panel fuse holder (the old unit had an internal fusable link which was soldered in place).

•Rear-panel adjustable 28 MHz xmit input attenuator (the old unit had a similar control contained inside the box).

•Modern appearance, attractive cabinet (the old unit was, well, an ugly duckling, but it worked well).

These are only the obvious advantages; the improved circuitry offers additional advantages which become apparent only after laboratory analysis or on-the-air use. For example, the 116 MHz crystal oscillator is almost entirely free from spurious outputs and noise, the user benefits being improved transmit and receive (spectral) performance. This is accomplished by bandpass filtering, and feeding the crystal oscillator output through the crystal itself before driving the mixers.

The transmitter driver stage is a 2N6082, rated at 20 watts output power, and the final power amplifier is an SD1278, which is rated at 50 watts output. The Microwave Modules design includes a 50% derating factor, then, for these devices, and the result is a very linear transmit section and very clean spectral performance. The built-in transmit ALC (automatic level control) is driven by the transmitter output and controls drive to the transmit mixer using a diode attenuator. This circuit, too, works very well and allows the user to preset any maximum output level he or she wishes. For example, if your (outboard) final power amplifier requires only 10 watts drive and not the full 25 watts available from the MMT144/28R, it is a simple matter to set the ALC adjustment (an internal variable control designated "VR2") for 10 watts maximum output, at which point the ALC circuit will limit the peak transmitter output from that moment forward. This adjustment has no apparent effect on transmitter noise, signal-to-noise ratio, or spurious performance. Using this ALC control is much easier than building resistive attenuators or other methods of reducing RF drive to an outboard final amp. Actually, I'd like to see this ALC potentiometer as a front-panel control which could be used to set power output from day to day or contact to contact.

The 28 MHz input stage is a pair of push-pull dual-gate MOSFETs in a balanced mixer circuit, as in the previous Microwave Modules models, but it is far more senstitive than the earlier design. In fact, my unit could be driven to full output power with less than 500 uw (microwatts), or one-half milliwatt, of 28 MHz drive! This should be great news to owners of ICOM HF-band equipment, which can only provide about 1 mw max transverter drive. The 28 MHz signal is also sampled by an operational amplifier which drives the internal T/R relay circuit, assuring its sensitivity is at least equal to that of the transmit mixer.

Receiving functions are performed by an NE411 series dual-gate GaAsFET (Gallium Arsenide Field Effect Transistor) driving a ring of STE M14 hot-carrier diodes in a well-balanced mixer circuit. As I'll detail later, receive performance is *excellent*, a very noticeable improvement over earlier MMT units, and just about anything else I've used on 2 meters. Such outstanding receive performance is the result of careful gain distribution and a high-level balanced mixer stage (L.O. drive to the receive mixer was measured at more than + 10 dBm, or 10 mw). The output of the receive mixer is fed to a grounded-gate JFET (Junction Field Effect Transistor) and a tuned circuit at 28 MHz, and then to the station receiver. Overall conversion gain is relatively low, making the receive section seem very "quiet," but sub-microvolt level signals simply "jump" out of the noise and are easily readable.

I obtained my evaluation unit as a factory-fresh model from The PX Shack in Belle Mead, New Jersey and had the opportunity to use it on the air from my home station for about three weeks prior to obtaining some lab space and running tests and measurements as detailed herein. I was immediately impressed with the "quietness" of the receive section, as compared with my previous 2 meter receiving system which used a Janel Labs model 144CA converter. The old Janel product (manufactured in 1976) has been an excellent performer and showed a measured noise figure of

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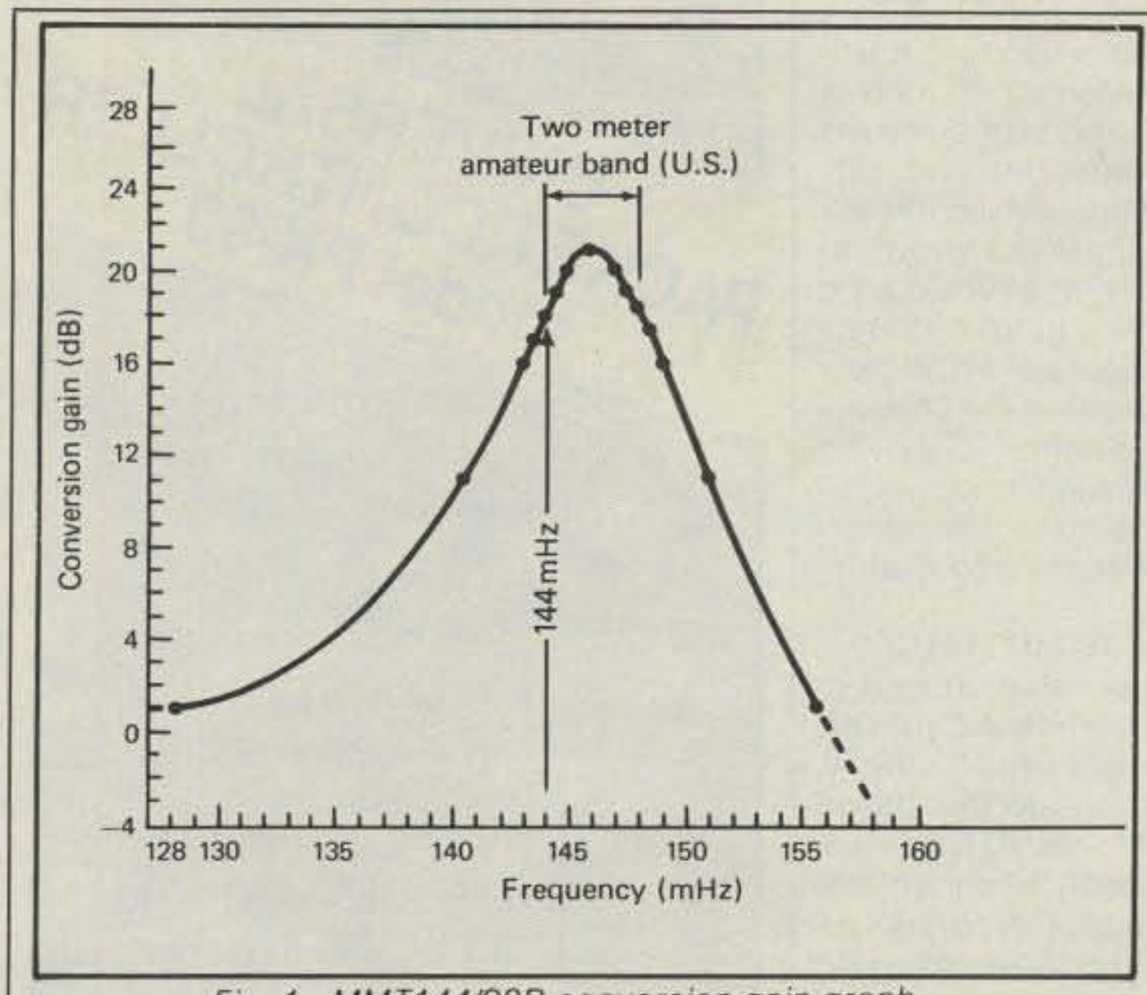

Fig. 1– MMT144/28R conversion gain graph.

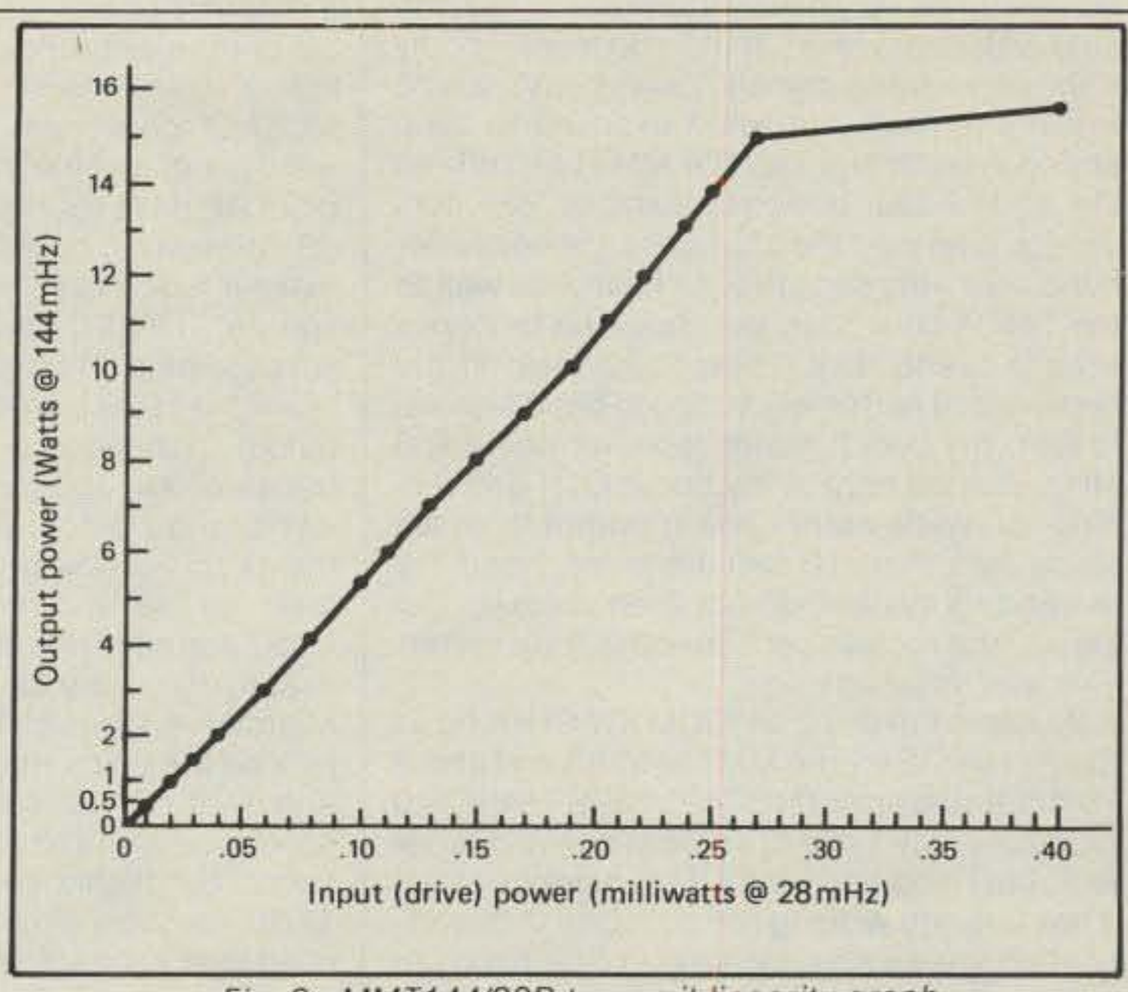

Fig. 2– MMT144/28R transmit linearity graph.

gain actually peaked at 146 MHz, where it measured 20.8 dB. The receiving converter's gain:bandwidth plot is shown in fig. 1, and indicates the −10 dB points to be 140.5 and 151.0 MHz, with −20 dB points at 128.1 and 155.6 MHz. The receive converter obviously covers the entire 2 meter amateur band with room to spare, but it does drop off fairly well a few MHz above and below our band limits, offering some rejection to out-of-band signals. KT2B's unit showed 21 dB conversion gain, peaking at 144.9 MHz, so it's apparent that not all these units are factory adjusted exactly the same way. I assume the factory adjustment is for minimum noise figure with a 50 ohm input termination (noise source).

A measurement of the 1 dB compression point, a valid indicator of receive overload performance, resulted in figures that were no surprise to me. The 1 dB compression point was at +6 dBm output at 28 MHz (−12 dBm input at 144 MHz), an excellent showing. This is on par with the best GaAsFET preamps/converters available, and demonstrates the receive converter's ability to handle really strong signals. Of course, the 28 MHz receiver might overload at +6 dBm input levels, but that won't be the transverter's fault! To prevent IF receiver saturation, an attentuator could be switched in series with the receiver's front end. Some HF receivers have such a provision built-in.

Using the variable persistance feature of the HP 141T mainframe, we were able to narrow up the video bandwith to 10 Hz and the IF bandwith to 1 kHz to measure S + N/N at very low 144 MHz input levels. The MMT144/28R showed a 10 dB S + N/N at −130 dBm, or about .07 uV. This is outstanding performance, and indicates the receiver's ability to resolve signals down to about .02 uV, or 20 nanovolts! Since the shape factor of the IF filter was unknown, and we don't know exactly how much noise was generated by the spectrum analyzer itself, it is impossible to directly relate this sensitivity figure to noise figure. However, it is very likely that the manufacturer's claimed noise figure of 2 dB maximum is a reality. As those of us who work with GaAsFETs are aware, a 2 dB NF for an NE411 device is child's play; this device should be capable of 0.5 dB NF at 144 MHz. Of course, circuit losses, including those of the PIN diode RF switch in the transverter, will add to the overall noise figure.

Let me mention a nice feature of the MMT144/28R's design: The input to the GaAsFET is shunted by a PIN diode offering very low resistance to ground when the transverter is keyed into the "transmit" mode. This will serve to further isolate the fragile GaAs device from your transmitted RF signal, no matter what its level. I'm using just a single Kilovac/Dow-Key series 60 T/R relay outboard to the transverter, and I'm running 1 kilowatt output power, and have not damaged or degraded the NE411 device in my transverter in about 10 weeks of frequent operation. Surely the clamping diode which shorts out the input to the NE411 on "TX" helps save this costly device.

The next laboratory measurement we performed was one which should be of consid-

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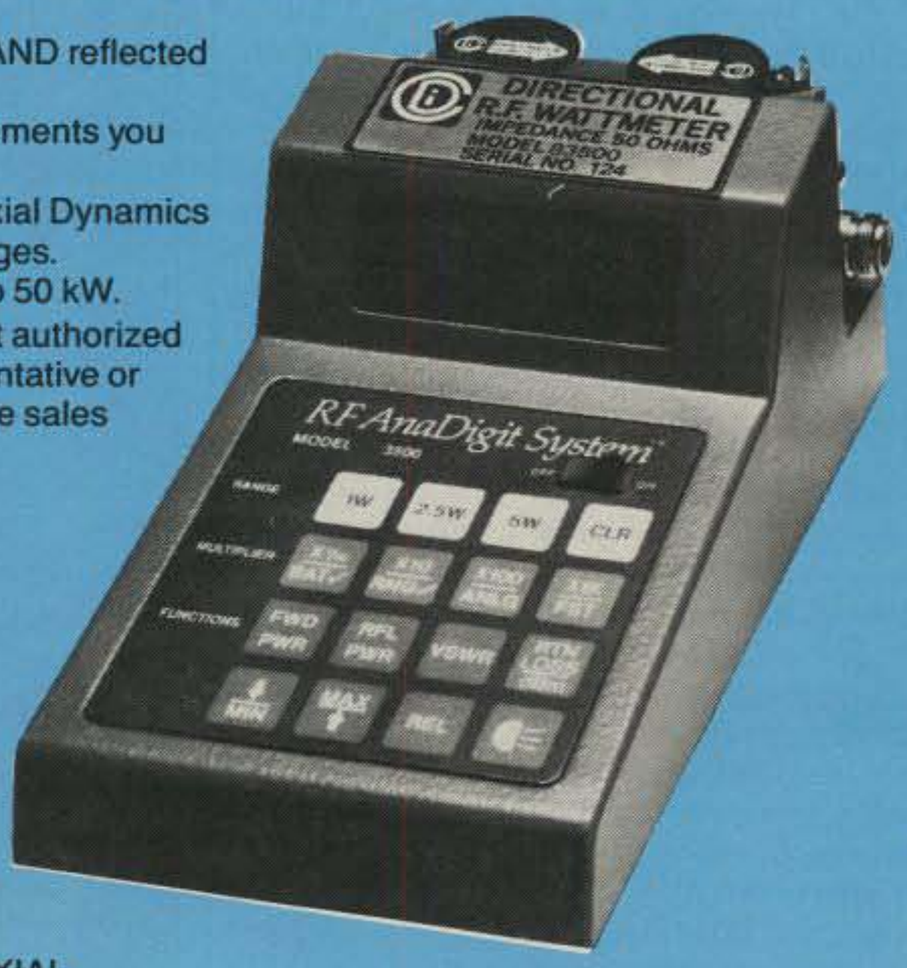

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less than 2 dB, so I never bothered using a preamp with it; however, it did "desense" badly from very strong signals (>> 1 mV), and it would intermodulate when exposed to such strong in-band signals. The MMT144/28R, on the other hand, obviously exhibits less conversion gain than the old Janel Labs converter but is very, very sensitive. It "hears" as well as the 144CA converter, yet shows no tendency toward overload or "desense," even in the presence of extremely strong in-band signals. In fact, my own 2 meter repeater on 14.805 MHz, located here at my home QTH and running 150 watts carrier power output to an antenna less than 10 feet from my "main" 2 meter Yagi system, did not even seem to "desense" the receive section of this transverter! *This* was amazing!

At home I'm using an ICOM IC740 HF rig as the 28 MHz IF for the MMT144/28R and also a 70 cm transverter (MMT432/28S). The IC740 produces only 1 mw drive from its transverter jack, but I modified my ICOM to produce about 5 mw (anyone wishing the details of this modification are welcome to write: I'll be happy to oblige). Even 5 mw would be a marginal drive signal for the old Microwave Modules transverters, but it was way too much for the MMT144/28R as factory adjusted. I decreased the transverter's input sensitivity using the input level adjustment control—a recessed potentiometer which can be accessed through a hole in the rear panel—until I could just achieve the apparent maximum 144 MHz output power as indicated by the front-panel LED bargraph.

I should mention at this point that I modified my unit to have a separate 144 MHz receiver input jack, as my station's relay switching scheme requires this. As supplied, the MMT144/28R has separate 28 MHz TX/RX receptacles (type SO-239 "UHF") but only one 144 MHz jack used for both transmission and reception. For "barefoot" operators this is no problem. Just plug your antenna into the 144 MHz receptacle, and you're done. But for me, using an outboard (homebrew) kilowatt amplifier with sequenced coaxial relays, I needed a separate RX jack for 2 meters. This modification was easy, and took about five minutes. I simply unsoldered the coaxial cable connecting point "M" on the L.O./RX mixer board to point "M" on the TX PA board, added a 220 pF silver mica capacitor between the tap on the RX input coil to TR6 (the GaAsFET) and the coaxial input line, and resoldered this coax line to a BNC jack added to the rear panel of the transverter. Still, I wish that Microwave Modules provided either a separate 144 MHz RX input jack or at least a dummy jack which could be wired up for this by the user.

I should also mention that unlike the earlier Microwave Modules 2 meter transverter (MMT144/28), the new "R" version does not contain an IF T/R relay; thus, the 28 MHz input and output ports require separate connection to the HF band equipment. This is not a big deal, as most modern HF transceivers have provision for a separate receive antenna, and those that don't can be easily modified. The 70 cm Microwave Modules transverter (MMT432/28S) never had an internal IF T/R relay.

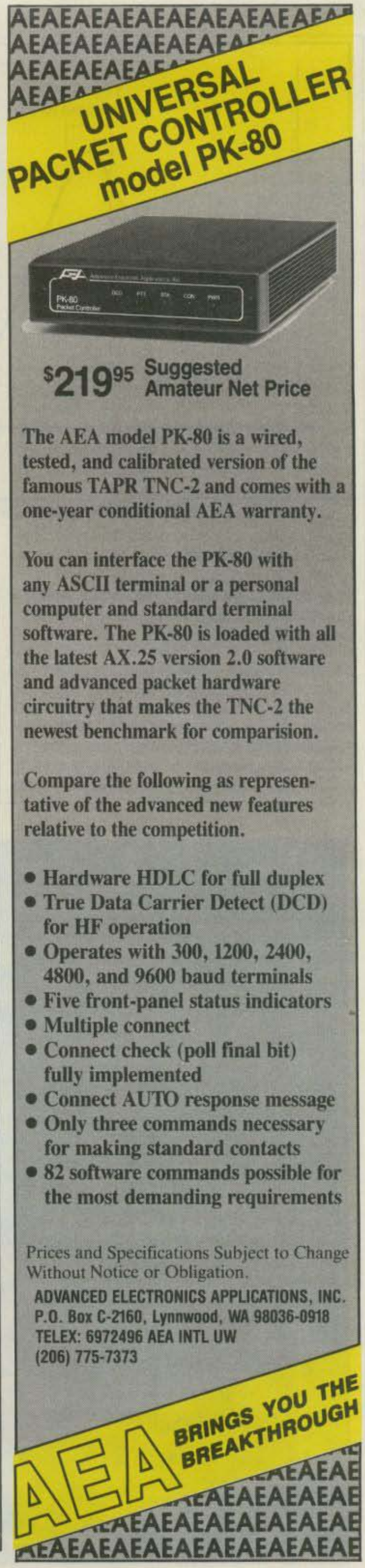
Initial on-the-air tests with the MMT144/28R were gratifying. As mentioned earlier, I was immediately impressed with the receive section and its immunity to overload, intermod products, and "desense" from strong local stations. Just using the product on the air makes it impossible to define this immunity in numbers, but I had a feeling that the receiver gain distribution was excellent and that its 1 dB compression point was very high, much higher than I was accustomed to with a MOSFET converter. Transmit signal reports were good, and the transverter provided sufficient RF drive for my KW final, which has a 3 dB attenuator built into the input circuit to make it look more like 50 ohms to any driving source. The LED bargraph lit to full brilliance (all segments lit) on voice peaks or in CW "key down," and I assumed this was about 25 watts output. Subsequent measurements showed transmit output power limiting to about 17 watts, and I didn't want to make any adjustments to the unit prior to running laboratory tests, so I settled for this.

DC and control wiring to the MMT144/28R is exactly the same as for the earlier models of Microwave Modules transverters. A 5-pin DIN jack on the unit's rear panel is used for the + and − 13.8 vdc connections to the station power supply, and also for the PTT line (optional, but highly suggested!) to control the TX/RX function. A mating 5-pin DIN plug is supplied with each transverter, as are mating RF connectors. The transverter comes well packed and includes an operating manual which is very handsome but rather poor in content. My #2 recommendation to Microwave Moduels Ltd. (*#1* was the separate 144 MHz RF jack) is to upgrade their operating manual, and to please include a parts list!

This brings us to the laboratory measurements section of this review. I was fortunate to have access to the RFI lab at Hewlett Packard Company's New Jersey Division, thanks to Charlie Rothschild, WB2INB, a friend who works there and who supervised the activities. Pete Putman, KT2B, another VHF enthusiast, was also along to witness these tests and to provide a second evaluation unit of the MMT144/28R for comparison. We used a well-regulated 35 amp power supply set to 13.8 vdc output, a Hewlett Packard model 8640B signal generator (prechecked for spurious levels), and an HP model 8554/8556/141T RF/IF/mainframe spectrum analyzer for most of the tests. This spectrum analyzer is nice in that it can be used as a tuned power meter as well, utilizing the 2 dB log function to resolve about 0.1 dB changes in level. I set the spectrum analyzer's IF gain so that the analyzer exactly agreed with the signal generator's calibrated output level. We did not have access to a noise figure meter on this occasion, so we measured S + N/N (signal plus noise to noise ratio) in a 1 kHz IF bandwidth (with considerable video display smoothing) to estimate receive sensitivity.

The first thing I noticed about the receive converter was the L.O. output level present at the 28 MHz IF port. It measured −36 dBm at 116 MHz, and this seemed like a rather large signal until I realized it represents about 46 dB rejection of the L.O. signal by the doubly-balanced mixer. Pretty good. KT2B's unit measured −34 dBm, 2 dB stronger, so I suspect this level is about normal for the MMT144/28R. It would be easy to reduce the intensity of this signal with an internal trap, but most 28 MHz receivers shouldn't notice that this signal is even present, since it is 88 MHz out of the IF band. Just for information's sake, the second harmonic of the L.O. output present at this port was −47 dBm, about 11 dB below the primary 116 MHz signal.

I measured receive section conversion gain to be 19 dB at 144 MHz, about 3 dB below the manufacturer's specification of 22 dB; however, it should be noted that the conversion



erable interest to the weak-signal hounds, and one which I seldom see any reviewer perform: transmit linearity. I set up the HP 8640B signal generator as the 28 MHz drive source to the transverter and monitored 144 MHz power output on a calibrated wattmeter, using different detectors and meter scales to accommodate the wide spread of readings. The results? Fantastic linearity, to at least 15 watts output power, which was nearly the maximum my unit would deliver without field adjustment.

I plotted power output in 500 mw increments versus 28 MHz drive level as indicated by the 8640B (which is accurate to 0.1 dB in the ranges used). An output of 500 mw was achieved with .01 mw drive; 1 watt output was achieved with .02 mw drive; and so on, up to 15 watts output at .27 mw drive. Input level versus output level is plotted in fig. 2, and as you can see, the transmitter linearity, even down to very low levels, is excellent. I've made similar tests on other commercially manufactured amateur equipment and have seldom seen such linear results with solid-state gear, especially at VHF.

We also measured spectral purity of the transmit section running at various output levels. A "close in" look revealed a very clean carrier with no phase noise or jitter evident. Of course, everything has phase noise, but looking down to −70 dB from the carrier, in a 1 kHz "window," we couldn't find any. Broadening our horizon a bit, we looked for L.O. output at 116 MHz to find it down more than 60 dB. Then we took a "broad band" look at the spectrum to find the second harmonic (288 MHz) down 48 dB and the third harmonic (432 MHz) down more than 60 dB. The fourth and higher order harmonics could not be detected with −70 dB resolution. This data did not change from 5 watts to 15 watts (max) output power. In case you're wondering, we used a microwave (resistive) 30 dB attenuator rated at 50 watts to reduce the output signal from the MMT144/28R to nondestructive levels for the HP spectrum analyzer. I'm glad we remembered to do that, for I can't afford the repair bill to replace the input attenuator and mixer of the 8554.

Other manufacturer's specifications we could confirm were L.O. maximum frequency error (rated at 1.5 kHz worst case; my unit is within 100 Hz after a 5–10 minute warm-up), L.O. drift (rated at 1 kHz/hour, but they don't say over what temperature range; my unit is stable within 100 Hz/hour after a 10 minute warm-up in a normal "hamshack" environment), quiescent current (rated 120 mA typical on receive, measured 120 mA), and transmit peak current (rated 4.7 amps, measured 3.9 amps at 17 watts output). The −600 kHa and +600 kHz offset functions worked fine and were accurate to within 1 kHz, but my IC740 doesn't have the optional FM unit, so I was not able to use the MMT144/28R for FM simplex or repeaters. Presumably, if your 28 MHz rig sounds good on FM, then your 2 meter FM signal will sound exactly the same. After all, this is a linear RF transverter and it shouldn't care what mode you're using!

Now I can mention that my unit, factory-set to limit at just over 15 watts output power on transmit, is actually capable of making more than 25 watts output. As stated earlier, I didn't want to make any internal adjustments on the unit prior to performing laboratory tests. After our tests were concluded, however, I brought the unit home and adjusted the ALC control while driving the unit with about 500 uw at 28 MHz, and was able to increase the power output to just over 25 watts. Why this control was set so conservatively at the factory remains a mystery. Since I only need about 5 watts drive for my dual 4CX250 power amplifier, I reset the ALC to limit at this level; but those who intend to run the transverter barefoot, or use the unit to drive a solid-state amplifier which requires perhaps 30 watts input for rated output, can surely adjust their MMT144/28R for lots more output than I use. I did not have the opportunity to run the transmitter linearity tests over again at the higher output level, but I feel that the results would indicate good linearity to 25 watts output power. The reason my curve of fig. 2 shows an input:output nonlinearity at the high end is undoubtedly due to the ALC action limiting output power at the preset 15 watt level.

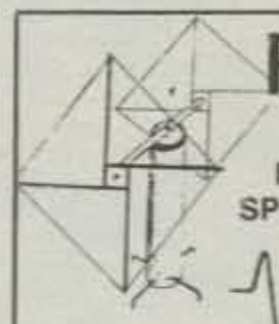
While the "R" series transverter features a sensitive and adjustable-dropout RF VOX circuit, I do not recommend any SSB/CW operator make use of this; RF VOX is a nuisance to both operator and listener. I can *always* tell when a VHFer is using RF-keyed equipment (transverter, amplifier, etc.) and frankly cannot tolerate listening to it. Connect the PTT line and you'll sound much better!

In all, the MMT144/28R is an excellent product which would make a fine addition to any VHFer's shack. I think that once word of this unit spreads, weak-signal enthusiasts all over will begin replacing their older transverters with this improved product. I'll recommend the /28R to anybody, but still feel strongly that the manufacturer should provide a better owner's manual and a 144 MHz RX input jack. Maybe this review will be the impetus for Microwave Modules to put a bit more effort into these areas.

The MMT144/28R has a list price of $325 (U.S.) and discounts may be available. This and other Microwave Modules Ltd. products are available only via authorized U.S. distributors. The review units were supplied by The PX Shack, 52 Stonewyck Dr., Belle Mead, NJ 08502.

Well, that's about it for this month. We've received more than 500 logs total (wow!) from the first *CQ* World-Wide VHF WPX Contest, and the results, plus an announcement of the *second* annual VHF WPX Contest, are planned for publication shortly. Keep reading! And keep writing. This would be a dull column without your input.

73, Steve, WB2WIK



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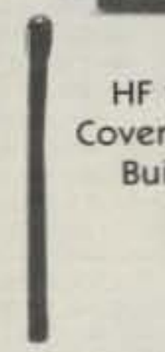

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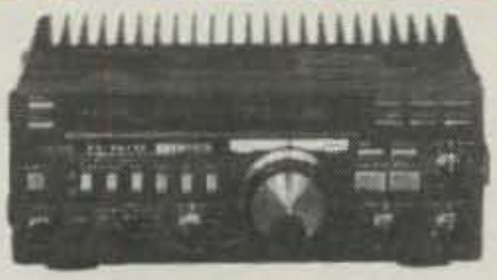

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AAAA WANTED: Radio tubes (50s, 211, 845). Western Electric Equipment (Tube, Amp, Mixer, Console, Speaker, Driver, Horn, Microphone, Parts, etc.). Triaxial, Coaxial speakers of Jensen, Trusonic, Altec, Tannoy, JBL 150-4C, N-500. David, P.O. Box 832, Monterey Park, CA 91754, Tel: 1-818-576-2642.

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RESISTORS: Any Value/Quantity, ¼ watt @$.01, ½ watt @ $.015 ($1.00 minimum). Quantity discounts, 1,000+. Send wattage(s), value(s), quantity(s), and remittance to T.O.R.C.C.C. Electronics, Box 47148, Chicago, Illinois 60647; (312) 342-9171.

RS-232 TRI-STATE BREAKOUT BOX. Never used, still under warranty. Cost $250, sell for $125. Bill Johnston, N5KR, 1808 Pomona, Las Cruces, NM 88001.

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QSL CARDS: 100 for $6.25 and 500 for $20.00 postpaid. SASE for a sample. Ken Hand, WB2EUF, P.O. Box 708, East Hampton, NY 11937.

MICROLOG AIR-1 (AMTOR), for VIC-20, mint $200. Shirer, 346 S. Jackson St., Green Bay, WI 54301, phone 414-437-3968.

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COLLINS KWM-2A, 516F2 AC power supply, 96 crystal pack, $900. Heathkit SB-200, $275. To settle estate. E. Routa, 1322 S. 59th Court, Cicero, IL 60650.

COLLINS S-LINE, including 75S3-B Receiver, 32S3 Transmitter, 516F-2 P.S., and 312B-4 Station Control, ALL ROUND EMBLEM, $1100.00 75A4 Receiver in good condition, $325.00. Call Marty, WB2FYF, at 201-721-5121 12 to 5 p.m., or 201-721-5432 10 p.m. to 12 midnight.

KENWOOD TS-520S, AT-200, $425. Late Heathkit HW-101, HP-23, $195. K1LEC, N. Springfield, VT 05150-0073 (802-886-8121).

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ANTIQUE RADIOS, schematics, tubes & literature, send $1 to VRS (CQ), 376 Cilley Rd., Manchester, NH 03103 for large catalog.

TELEGRAPH or wireless key made in China for use in China wanted for my collection. Dick Randall, K6ARE, 1263 Lakehurst Rd., Livermore, CA 94550.

HRO7, Classic Receiver, coils for LW to 30 MHz, with matching speaker, power supply, manual, immaculate, $150. Call (203) 426-8041.

TRYGON ELECTRONICS Super Mercury power supply schematic needed (Model No. M5P60-10). KA1LOA, 13 Judith Rd., Chelmsford, MA 01824.

NCL-2000 PRODUCTION PARTS: SASE for special price list and/or list of National Radio manuals. Max J. Fuchs, 11 Plymouth Lane, Swapscott, MA 01907.

WANTED: WRL GLOBE TROTTER transmitter. Also need schematic/manual for Harvey-Wells Bandmaster Deluxe. D.J. Lowenstein, N7AF, 235 E. 15th St., Tempe, AZ 85281.

FOR SALE: QST's from 1928. ARRL and other Radio Handbooks from 1935. SASE for list. R.M. Killian, 129 Mill Rd., Chelmsford, MA 01824.

FOR SALE: Jefferson-Travis Radio Model 350A-1 transmitter-receiver unit and power unit Model 350 PS-1. Chuck, 312 Filer Ave., Twin Falls, ID 83301 (208-734-3144).

DRAKE R-4B, T-4XB, MS-4, AC-4, MN-4 with extras, $500. Orig. owner. Bob Hylka, 6029 56 Drive, Maspeth, NY 11378.

CASH PAID for military radio sets type AN/PRC-77 $200, PRC-25 $100, RT-524 or RT-246 $300, ARC-159 or ARC-164 $1200 ea. Mike Murphy, 11621 Valle Vista Rd., Lakeside, CA 92040 (619-561-2726).

WANTED: 304TL's (VT 129) or 304TH's (VT 259) in unused condition. Jorge E. Rodriguez, KP4MP, Box 10985, Caparra Station, Puerto Rico 00922.

FOR SALE: Heathkit GR-54 receiver, 200 kHz to 30 MHz, $50. Dick Yerian, KE4YC, 108 Woodgrove Lane, Cary, NC 27511 (919-851-7054).

NEED manual or copy for MFJ 941-B 300 watts Versa Tuner II. Please contact me: CE5NA, R. Claramunt, Casilla 1305 Concepcion, Chile.

WANTED: Power transformer for Dentron Clipperton L Linear Amp. State price. Hector Zeno, KI4PW, 3205 Chapin Ave., Tampa, FL 33611.

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NEEDED: Service manual or information on the Zenith, Long Distance Receiver, era 1935. Will help with costs or send price in letter to: R.W. Atkinson, 1520 Orange Rd. #20, Ashland, OH 44805.

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WANTED: Used Apple Pascal system and/or CP/M. Fred Gunther, K7FG, 1402 W. Craig, Moses Lake, WA 98837.

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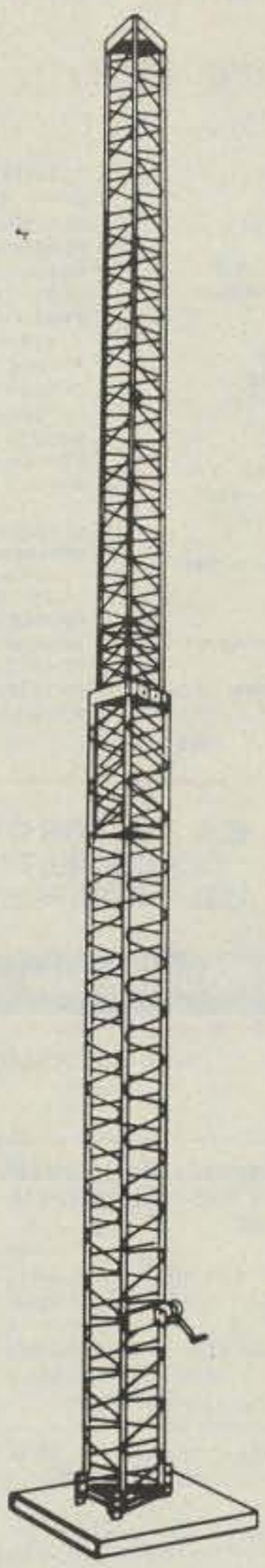

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FOR SALE: Used Ham equipment. SASE for list. J. Bedlovies, 241 Dover St., Bridgeport, CT 06610.

TRADE: Heath SB-220 for IC-271A or $475. Sell: Drake AC-10 power supply, needs transistor $10; Dowkey DK60-2C coaxial relay, $20. KØMK 218-865-6541.

WANT: ICOM 280 Control Head. I have main section. K6TEN, Vince, 20129 Suisun Dr., Cupertino, CA 95014 (408-252-6551).

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COLLEGE HAM CLUB needs CQ Magazines: 1981 through Oct. 1983 for campus library project. Tax deductible! Bob May, ETSU/ARC, Box 19060A, Johnson City, TN 37614.

WANTED: Heath ID 4101. Dual trace scope electronic switch, with manual. Len Cumbo, KD2NH, 384 Driving Park Ave., Rochester, NY 14613 (716-458-6576).

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WANTED: ICOM IC-2, IC-3, IC-4 transceivers and ICOM accessories. FOR SALE: Heath HW-32A, HP-13A, OM-2 scope, MT-1 Cheyenne xmtr., QF-1 Q multi., AM-1 ant. imp. mtr., AM-2 SWR mtr., NAVY LM-15 freq. mtr., Johnson 6N2 xmtr. Mike Ludkiewicz, 143 Richmond Rd., Ludlow, MA 01056.

FOR SALE: Heath HW-16 Transceiver with matching HG-10B VFO. $100 + shipping, or offer. Doug Kiessling, 7414 Colshire Drive #8, McLean, VA 22102 (703-821-0509).

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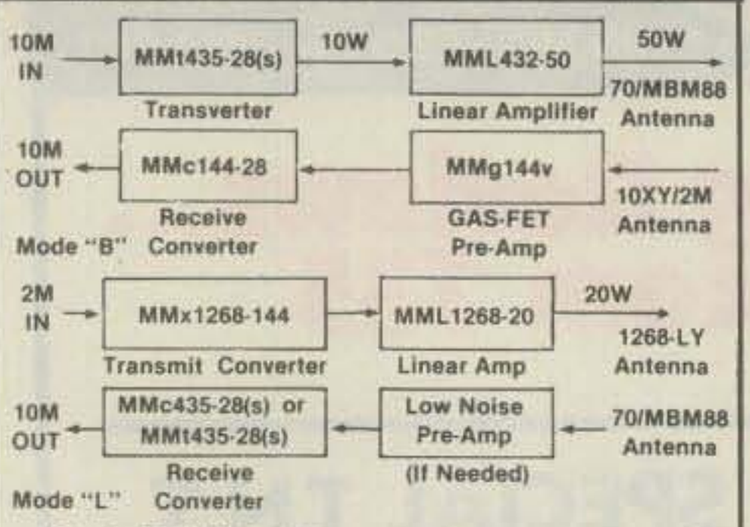

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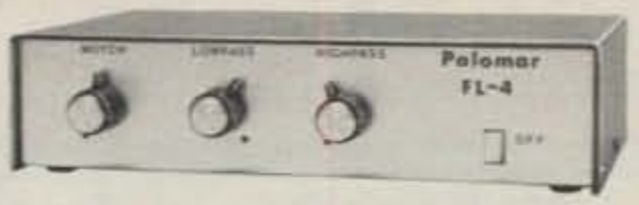

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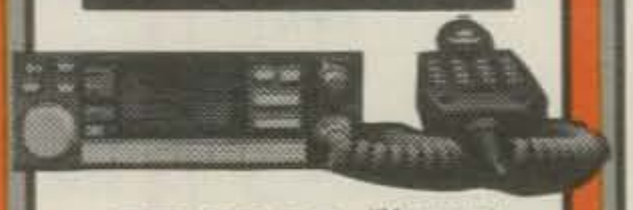

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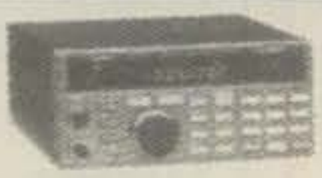

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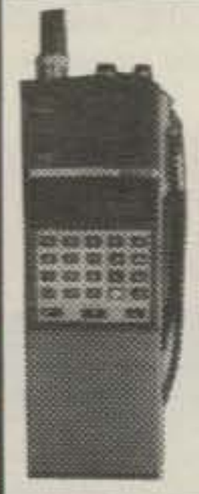

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SSB (PBT) XTAL	FL-30	9011.5	2.3
FM Filter	9M15A	9011.5	15 (-3dB)
SSB Narrow (Hygrade Crystal)	FL-44A	455	2.4
OPTIONAL FILTERS			
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CW Narrow	FL-53A	455	0.250
SSB Wide	FL-70	9011.5	2.8
CW Narrow	FL-32	9010.6	0.500
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